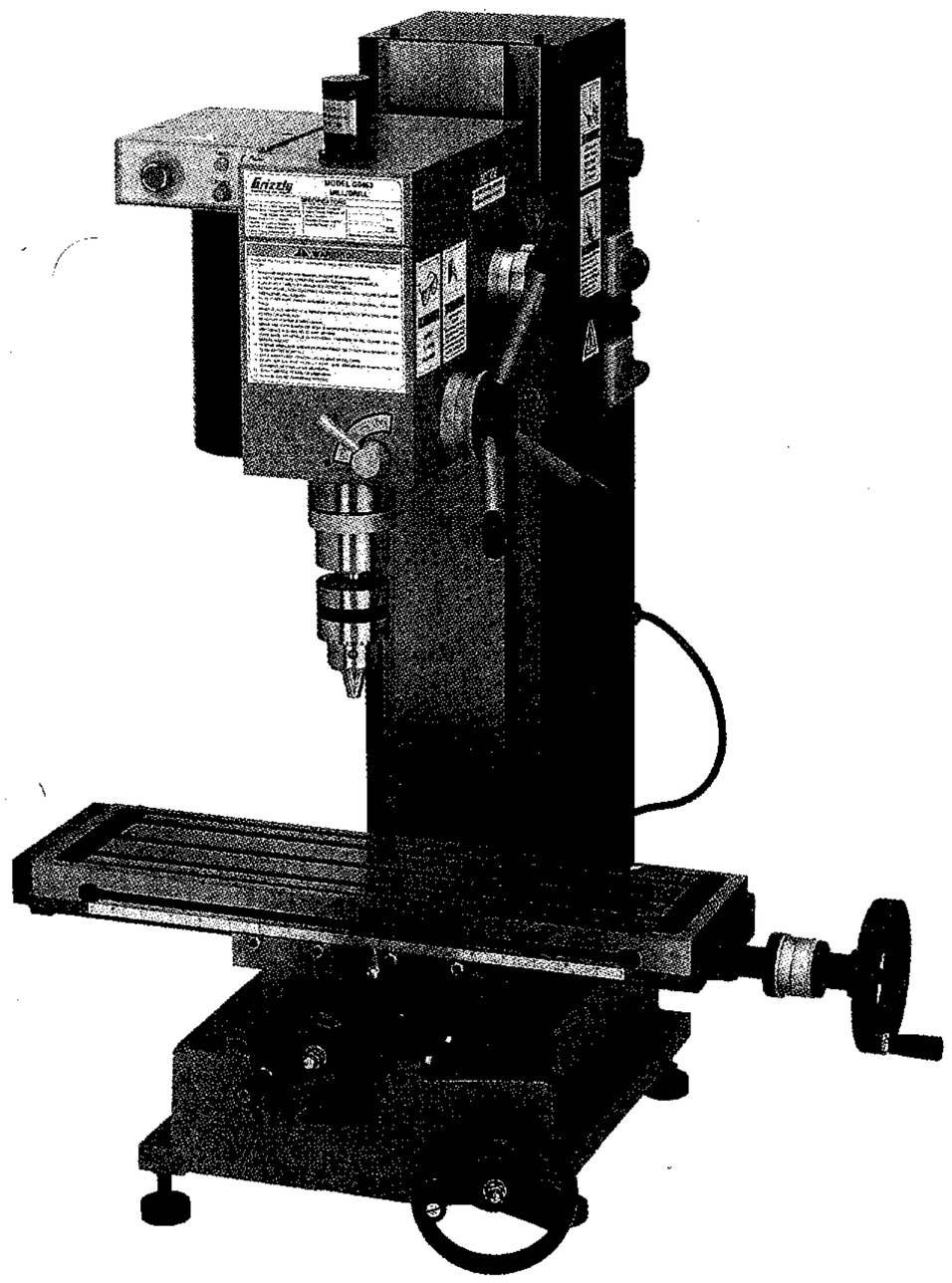
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Grizzly Industrial, Inc.®

MODEL G0463
SMALL MILL/DRILL
OWNER'S MANUAL



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WARNING: NO PORTION OF THIS MANUAL MAY BE REPRODUCED IN ANY SHAPE OR FORM WITHOUT THE WRITTEN APPROVAL OF GRIZZLY INDUSTRIAL, INC.
#PC7741 PRINTED IN CHINA

⚠ WARNING!

Some dust created by power sanding, sawing, grinding, drilling, and other construction activities contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm. Some examples of these chemical are:

- **Lead from lead-based paints.**
- **Crystalline silica from bricks, cement and other masonry products.**
- **Arsenic and chromium from chemically-treated lumber.**

Your risk from these exposures varies, depending on how often you do this type of work. To reduce your exposure to these chemicals: Work in a well ventilated area, and work with approved safety equipment, such as those dust masks that are specially designed to filter out microscopic particles.

⚠WARNING

Safety labels warn about machine hazards and ways to prevent injury. The owner of this machine MUST maintain the original location and readability of the labels on the machine. If any label is removed or becomes unreadable, REPLACE that label before using the machine again. Contact Grizzly at (800) 523-4777 or www.grizzly.com to order new labels.

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INTRODUCTION

Foreword

We are proud to offer the Model G0463 Small Mill/Drill. This machine is part of a growing Grizzly family of fine metalworking machinery. When used according to the guidelines set forth in this manual, you can expect years of trouble-free, enjoyable operation and proof of Grizzly's commitment to customer satisfaction.

We are pleased to provide this manual with the Model G0463. It was written to guide you through assembly, review safety considerations, and cover general operating procedures. It represents our effort to produce the best documentation possible.

The specifications, drawings, and photographs illustrated in this manual represent the Model G0463 as supplied when the manual was prepared. However, owing to Grizzly's policy of continuous improvement, changes may be made at any time with no obligation on the part of Grizzly. For your convenience, we always keep current Grizzly manuals available on our website at **www.grizzly.com**. Any updates to your machine will be reflected in these manuals as soon as they are complete. Visit our site often to check for the latest updates to this manual!

Contact Info

If you have any comments regarding this manual, please write to us at the address below:

Grizzly Industrial, Inc.
c/o Technical Documentation Manager
P.O. Box 2069
Bellingham, WA 98227-2069

We stand behind our machines. If you have any service questions or parts requests, please call or write us at the location listed below.

Grizzly Industrial, Inc.
1203 Lycoming Mall Circle
Muncy, PA 17756
Phone: (570) 546-9663
Fax: (800) 438-5901
E-Mail: techsupport@grizzly.com
Web Site: http://www.grizzly.com

Grizzly Industrial, Inc.®

MACHINE DATA SHEET

Customer Service #: (570) 546-9663 • To Order Call: (800) 523-4777 • Fax #: (800) 438-5901

Product Dimensions:

Weight..... 353 lbs.
Length/Width/Height..... 27 x 30 x 33-3/4 in.
Foot Print (Length/Width)..... 16 x 13 in.

Shipping Dimensions:

Type..... Wood Crate
Content..... Machine
Weight..... 372 lbs.
Length/Width/Height..... 30 x 32 x 42 in.

Electrical:

Switch..... Forward/Reverse
Switch Voltage..... 110V
Cord Length..... 7 ft.
Cord Gauge.....16 gauge
Recommended Breaker Size..... 15 amp
Plug.....NEMA 5-15

Motor:

Type..... Universal
Horsepower.....3/4 HP
Voltage.....110V
Prewired.....110V
Phase..... Single
Amps.....7A
Speed.....0-3725 RPM
Cycle.....60 Hz
Number Of Speeds.....Variable
Power Transfer Belt
Bearings.....Shielded, Permanently Lubricated

Main Specifications:

Spindle Travel	3-3/8 in.
Swing	18 in.
Longitudinal Table Travel	15-7/8 in.
Cross Table Travel	5-3/4 in.
Head Travel	14-7/8 in.
Max. Dist Spindle To Column	8 in.
Max. Dist Spindle To Table	14-3/4 in.
Drilling Cap For Cast Iron	1 in.
Drilling Cap For Steel	1in.
No. Of Vert. Spindle Speeds	High/Low
Range Of Vert. Spindle Speeds	0-1000, 0-2000 RPM
Quill Dia	2.362 in.

Table Info

Table Length	21-5/8 in.
Table Width	6-1/4 in.
Table Thickness	1-1/2 in.
No. Of T Slots	3
T Slots Width	0.470 in.
T Slots Height	0.750 in.
T Slots Centers	1-11/16 in.
Stud Size	3/8 in.
Lead Screw Diameter	5/8 in.
Lead Screw TPI	12
Lead Screw Length	26 in.

Construction

Spindle Housing Const	Cast Iron
Table Const	Surface Ground Cast Iron
Head Const	Cast Iron
Column Const	Surface Ground Cast Iron
Base Const	Cast Iron
Paint	Epoxy

Other

Collars Calibrated	0.001-0.0005 in.
Spindle Info	
Spindle Taper	R-8
Spindle Sleeve Diameter	2.280 in.
End Milling Cap	3/4 in.
Face Milling Cap	2 in.
Draw Bar Diameter	7/16-20 x 10-3/4 in.
Draw Bar TPI	20
Draw Bar Length	15-5/8 in.

Features

3-16mm Drill Chuck with Key R-8/JT-6 Arbor
Leveling Feet

Identification

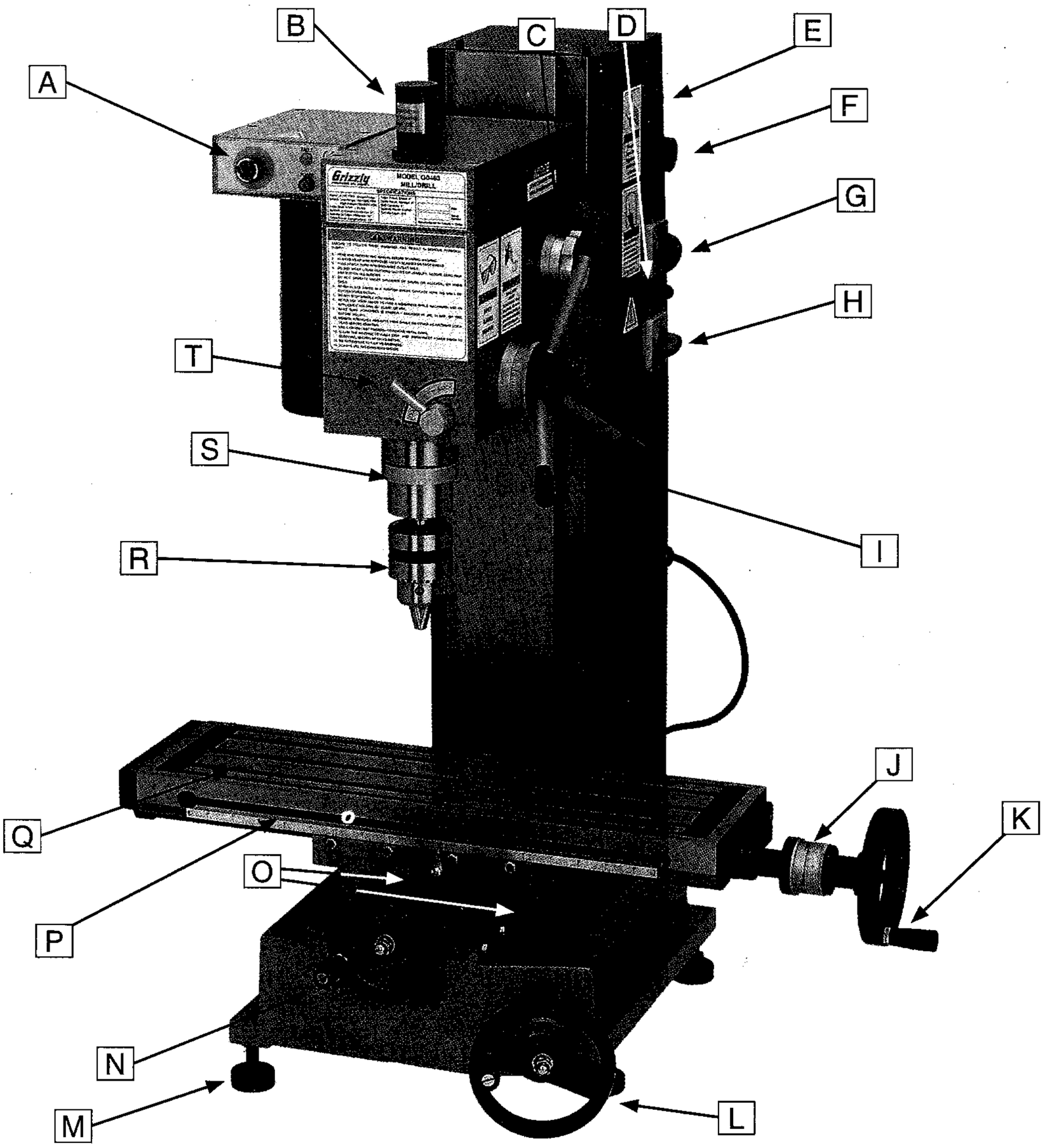


Figure 1. G0463 Identification.

A. Emergency Stop Button
B. Drawbar (under cover)
C. High/Low Gear Change Knob
D. Headstock Lock
E. Fuse Socket
F. Spindle RPM Control
G. Forward/Reverse Switch
H. Main Power Switch
I. Quill Feed Levers
J. Graduated Dials
K. Longitudinal (X-Axis) Handwheel
L. Vertical (Z Axis) Handwheel
M. Adjustable Feet
N. Cross (Y-Axis) Handwheel
O. Table Locks
P. Longitudinal Scale
Q. T-Slots and Coolant Trough
R. Drill Chuck
S. Quill
T. Quill Lock

SECTION 1: SAFETY

⚠WARNING

For Your Own Safety, Read Instruction Manual Before Operating this Machine

The purpose of safety symbols is to attract your attention to possible hazardous conditions. This manual uses a series of symbols and signal words which are intended to convey the level of importance of the safety messages. The progression of symbols is described below. Remember that safety messages by themselves do not eliminate danger and are not a substitute for proper accident prevention measures.

⚠DANGER — **Indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.**

⚠WARNING — **Indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.**

⚠CAUTION — **Indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury. It may also be used to alert against unsafe practices.**

NOTICE — **This symbol is used to alert the user to useful information about proper operation of the machine.**

⚠WARNING

Safety Instructions for Machinery

1. **READ THROUGH THE ENTIRE MANUAL BEFORE STARTING MACHINERY.** Machinery presents serious injury hazards to untrained users.

2. **ALWAYS USE ANSI APPROVED SAFETY GLASSES WHEN OPERATING MACHINERY.** Everyday eyeglasses only have impact resistant lenses, they are NOT safety glasses.

3. **ALWAYS WEAR AN ANSI APPROVED RESPIRATOR WHEN OPERATING MACHINERY THAT PRODUCES DUST.** Wood dust is a carcinogen and can cause cancer and severe respiratory illnesses.

4. **ALWAYS USE HEARING PROTECTION WHEN OPERATING MACHINERY.** Machinery noise can cause permanent hearing damage.

5. **WEAR PROPER APPAREL.** DO NOT wear loose clothing, gloves, neckties, rings, or jewelry which may get caught in moving parts. Wear protective hair covering to contain long hair and wear non-slip footwear.

6. **NEVER OPERATE MACHINERY WHEN TIRED, OR UNDER THE INFLUENCE OF DRUGS OR ALCOHOL.** Be mentally alert at all times when running machinery.

⚠WARNING
Safety Instructions for Machinery

7. **ONLY ALLOW TRAINED AND PROPERLY SUPERVISED PERSONNEL TO OPERATE MACHINERY.** Make sure operation instructions are safe and clearly understood.

8. **KEEP CHILDREN AND VISITORS AWAY.** Keep all children and visitors a safe distance from the work area.

9. **MAKE WORKSHOP CHILD PROOF.** Use padlocks, master switches, and remove start switch keys.

10. **NEVER LEAVE WHEN MACHINE IS RUNNING.** Turn power ***OFF*** and allow all moving parts to come to a complete stop before leaving machine unattended.

11. **DO NOT USE IN DANGEROUS ENVIRONMENTS.** DO NOT use machinery in damp, wet locations, or where any flammable or noxious fumes may exist.

12. **KEEP WORK AREA CLEAN AND WELL LIT.** Clutter and dark shadows may cause accidents.

13. **USE A GROUNDED EXTENSION CORD RATED FOR THE MACHINE AMPERAGE.** Undersized cords overheat and lose power. Replace extension cords if they become damaged. DO NOT use extension cords for 220V machinery.

14. **ALWAYS DISCONNECT FROM POWER SOURCE BEFORE SERVICING MACHINERY**. Make sure switch is in OFF position before reconnecting.

15. **MAINTAIN MACHINERY WITH CARE.** Keep blades sharp and clean for best and safest performance. Follow instructions for lubricating and changing accessories.

16. **MAKE SURE GUARDS ARE IN PLACE AND WORK CORRECTLY BEFORE USING MACHINERY.**

17. **REMOVE ADJUSTING KEYS AND WRENCHES.** Make a habit of checking for keys and adjusting wrenches before turning machinery ***ON***.

18. **CHECK FOR DAMAGED PARTS BEFORE USING MACHINERY.** Check for binding and alignment of parts, broken parts, part mounting, loose bolts, and any other conditions that may affect machine operation. Repair or replace damaged parts.

19. **USE RECOMMENDED ACCESSORIES.** Refer to the instruction manual for recommended accessories. The use of improper accessories may cause risk of injury.

20. **DO NOT FORCE MACHINERY.** Work at the speed for which the machine or accessory was designed.

21. **SECURE WORKPIECE.** Use clamps or a vise to hold the workpiece when practical. A secured workpiece protects your hands and frees both hands to operate the machine.

22. **DO NOT OVERREACH.** Keep proper footing and balance at all times.

23. **MANY MACHINES WILL EJECT THE WORKPIECE TOWARD THE OPERATOR.** Know and avoid conditions that cause the workpiece to "kickback."

24. **ALWAYS LOCK MOBILE BASES (IF USED) BEFORE OPERATING MACHINERY**.

25. **BE AWARE THAT CERTAIN DUST MAY BE HAZARDOUS** to the respiratory systems of people and animals, especially fine dust. Make sure you know the hazards associated with the type of dust you will be exposed to and always wear a respirator approved for that type of dust.

⚠WARNING
Additional Safety for Mill/Drills

1. **UNDERSTANDING CONTROLS.** Make sure you understand the use and operation of all controls.

2. **SAFETY ACCESSORIES.** Always use a chip guard in addition to your safety glasses when milling to prevent bodily injury.

3. **WORK HOLDING.** Before starting the machine, be certain the workpiece has been properly clamped to the table. NEVER hold the workpiece by hand when using the mill.

4. **CHUCK KEY SAFETY.** Always remove your chuck key, drawbar wrench, and any service tools immediately after use.

5. **SPINDLE SPEEDS.** Select the spindle speed that is appropriate for the type of work and material. Allow the mill/drill to gain full speed before beginning a cut.

6. **POWER DISRUPTION.** In the event of a local power outage during use of the mill, turn ***OFF*** all switches to avoid possible sudden start up once power is restored.

7. **SPINDLE DIRECTION CHANGES.** Never reverse spindle direction while the mill/drill is in motion.

8. **STOPPING SPINDLE.** DO NOT stop the mill/drill using your hand against the chuck.

9. **BE ATTENTIVE.** DO NOT leave mill/drill running unattended for any reason.

10. **MACHINE CARE AND MAINTENANCE.** Never operate the mill/drill with damaged or worn parts. Maintain your mill/drill in proper working condition. Perform routine inspections and maintenance promptly. Put away adjustment tools after use.

11. **DISCONNECT POWER.** Make sure the mill is turned ***OFF***, disconnected from its power source and all moving parts have come to a complete stop before starting any inspection, adjustment, or maintenance procedure.

12. **AVOIDING ENTANGLEMENT**. Keep loose clothing articles such as sleeves, belts or jewelry items away from the mill spindle. Never wear gloves when operating the mill.

13. **TOOL HOLDING.** Always use the proper tools for the material you are milling. Make sure they are held firmly in the proper tool holder for the job.

14. **CLEAN-UP.** DO NOT clear chips by hand. Use a brush, and never clear chips while the mill is turning.

15. **CUTTING TOOL INSPECTION.** Inspect drills and end mills for sharpness, chips, or cracks before each use. Replace dull, chipped, or cracked cutting tools immediately. Handle new cutting tools with care. Leading edges are very sharp and can cause lacerations.

13. **EXPERIENCING DIFFICULTIES.** If at any time you are experiencing difficulties performing the intended operation, stop using the machine! Contact our Technical Support at (570) 546-9663.

⚠WARNING

No list of safety guidelines can be complete. Every shop environment is different. Like all machines there is danger associated with the Model G0463. Accidents are frequently caused by lack of familiarity or failure to pay attention. Use this machine with respect and caution to lessen the possibility of operator injury. If normal safety precautions are overlooked or ignored, serious personal injury may occur.

SECTION 2: CIRCUIT REQUIREMENTS

110V Operation

⚠WARNING

Serious personal injury could occur if you connect the machine to the power source before you have completed the set up process. DO NOT connect the machine to the power source until instructed to do so.

Amperage Draw

The Model G0463 motor draws the following amps under maximum load:

Motor Draw.....7 Amps

Circuit Recommendations

We recommend connecting this machine to a dedicated circuit with a verified ground, using the circuit breaker size given below. Never replace a circuit breaker with one of higher amperage without consulting a qualified electrician to ensure compliance with wiring codes. **If you are unsure about the wiring codes in your area or you plan to connect your machine to a shared circuit, you may create a fire hazard—consult a qualified electrician to reduce this risk.**

Circuit Breaker.....10 Amps

Plug/Receptacle Type

Includèd Plug Type.....NEMA 5-15

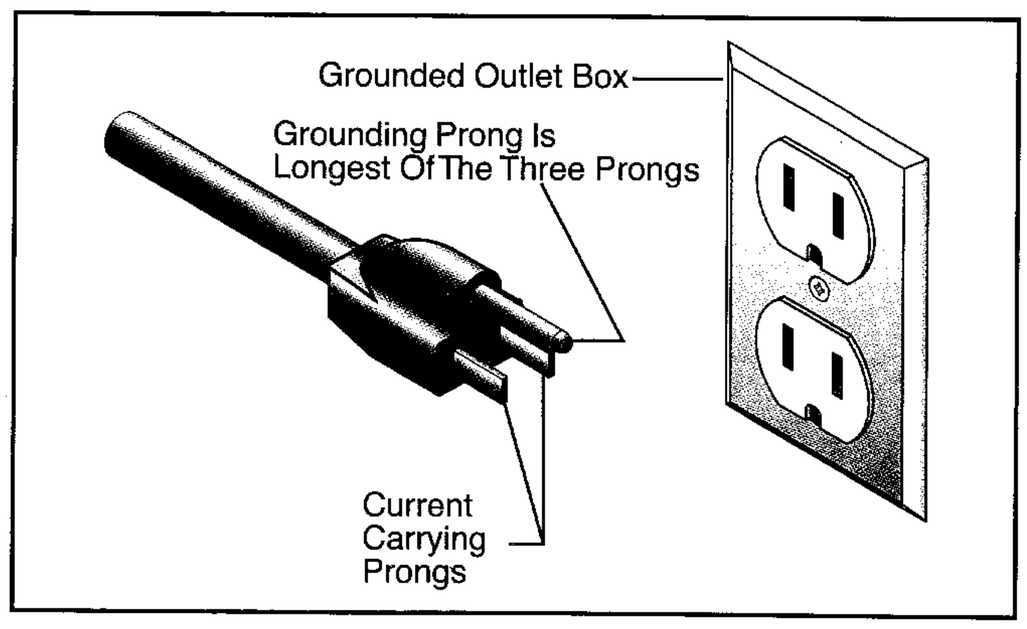
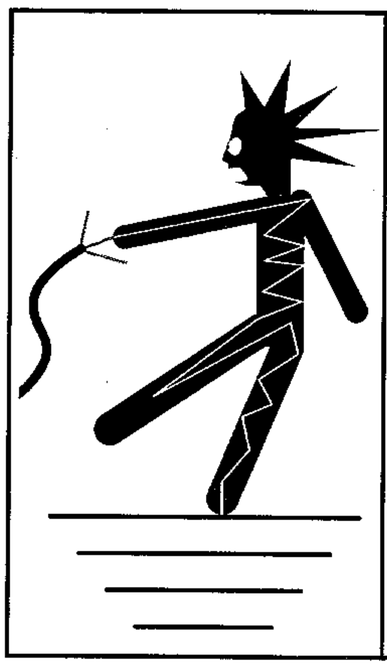
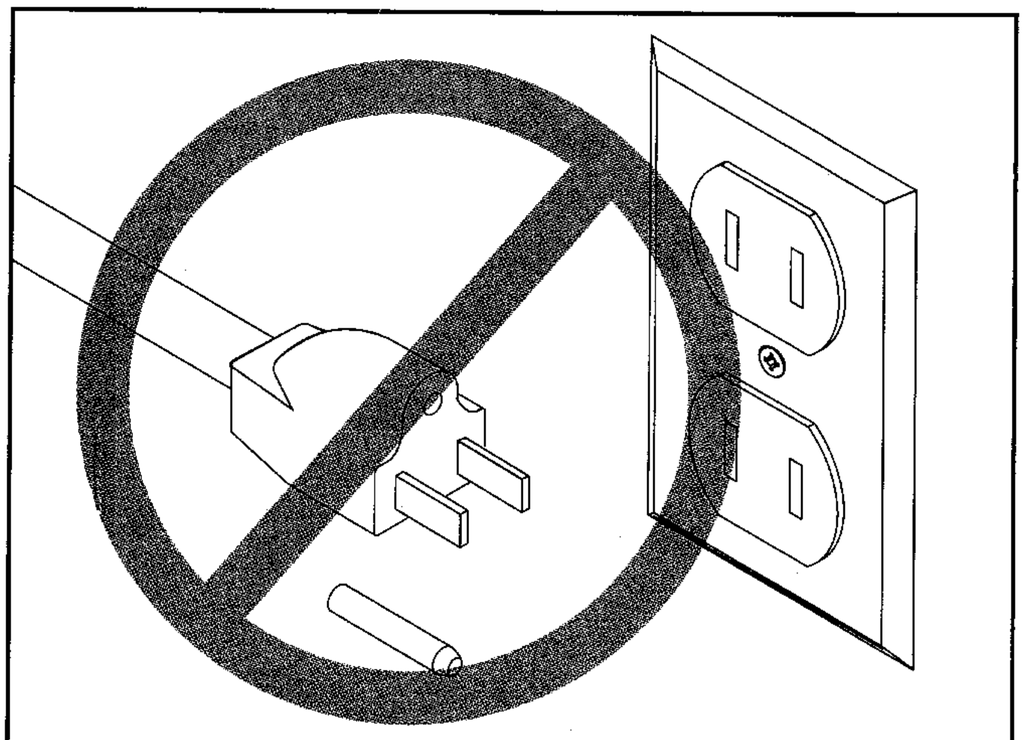


Figure 2. A 5-15 plug and receptacle.



⚠WARNING

Electrocution or fire could result if this machine is not grounded correctly or if your electrical configuration does not comply with local and state codes. Ensure compliance by checking with a qualified electrician!



⚠CAUTION

This machine must have a ground prong in the plug to help ensure that it is grounded. DO NOT remove ground prong from plug to fit into a two-pronged outlet! If the plug will not fit the outlet, have the proper outlet installed by a qualified electrician.

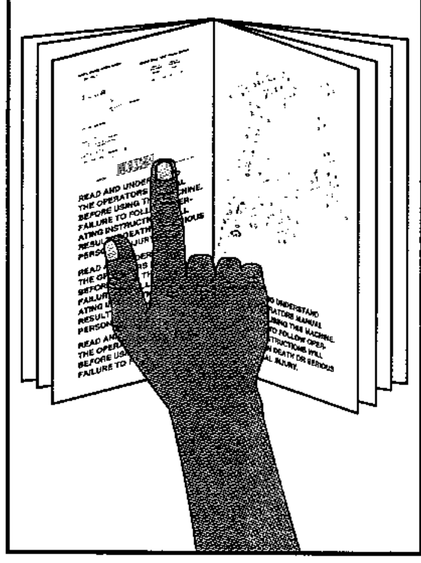
Extension Cords

We do not recommend the use of extension cords, if you find it absolutely necessary:

- Use at least a 16 gauge cord that does not exceed 50 feet in length!
- The extension cord must also contain a ground wire and plug pin.
- A qualified electrician MUST size cords over 50 feet long to prevent motor damage.

SECTION 3: SET UP

Set Up Safety



⚠WARNING

This machine presents serious injury hazards to untrained users. Read through this entire manual to become familiar with the controls and operations before starting the machine!



⚠WARNING

Wear safety glasses during the entire set up process!



⚠WARNING

The Model G0463 is a heavy machine. DO NOT over-exert yourself while unpacking or moving your machine—get assistance.

Items Needed for Set Up

The following items are needed to complete the set up process, but are not included with your machine:

Description	Qty
• Precision Level	1
• Safety Glasses (for each person)	1
• Solvent	1
• Shop Rags	1
• Metal Shim Stock	1
• Brass Hammer	1
• Power Drill (optional)	1
• Drill Bit 9/16"(optional)	1
• Hex Bolts M12-1.75 (length as needed)	4
• Flat Washers 12mm	8
• Lock Washers 12mm	4
• Hex Nuts M12-1.75	4
• An Assistant	1

Unpacking

The Model G0463 was carefully packed when it left our warehouse. If you discover the machine is damaged after you have signed for delivery, *please immediately call Customer Service at (570) 546-9663 for advice.*

Save the containers and all packing materials for possible inspection by the carrier or its agent. *Otherwise, filing a freight claim can be difficult.*

When you are completely satisfied with the condition of your shipment, you should inventory the contents.

Inventory

After all the parts have been removed from the two boxes, you should have the following items:

Box 1: (Figures 3 & 4)	Qty
A. Mill/Drill with Chuck	1
B. Spare Drive Belt 2 x 65	1
C. Oil Bottle	1
D. End Wrenches 8/10, 14/17, 17/19mm	1 ea
E. Chuck Key	1
F. Drift	1
G. Hex Wrenches 3, 4, 5 & 6mm	1 ea
H. Feet with Hex Nut M12-1.75	4
I. T-Nuts 3/8"	2
J. Pin Spanner Wrench	1

Items not shown:

Spare Fuse 1

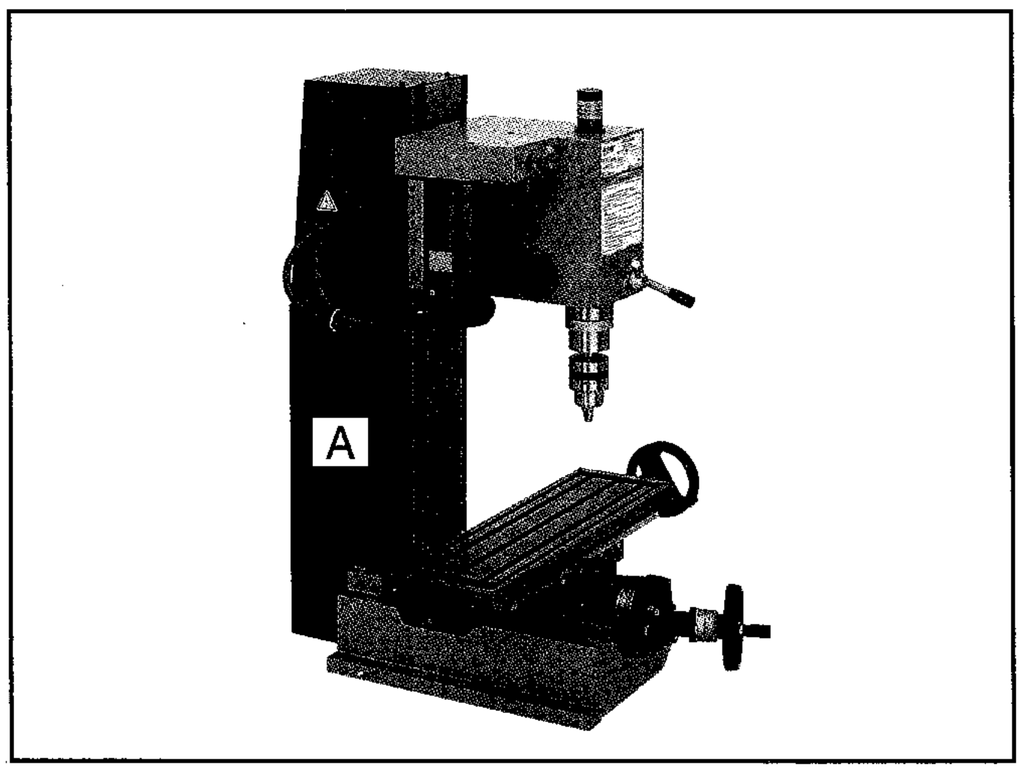


Figure 3. G0463 out of the crate.

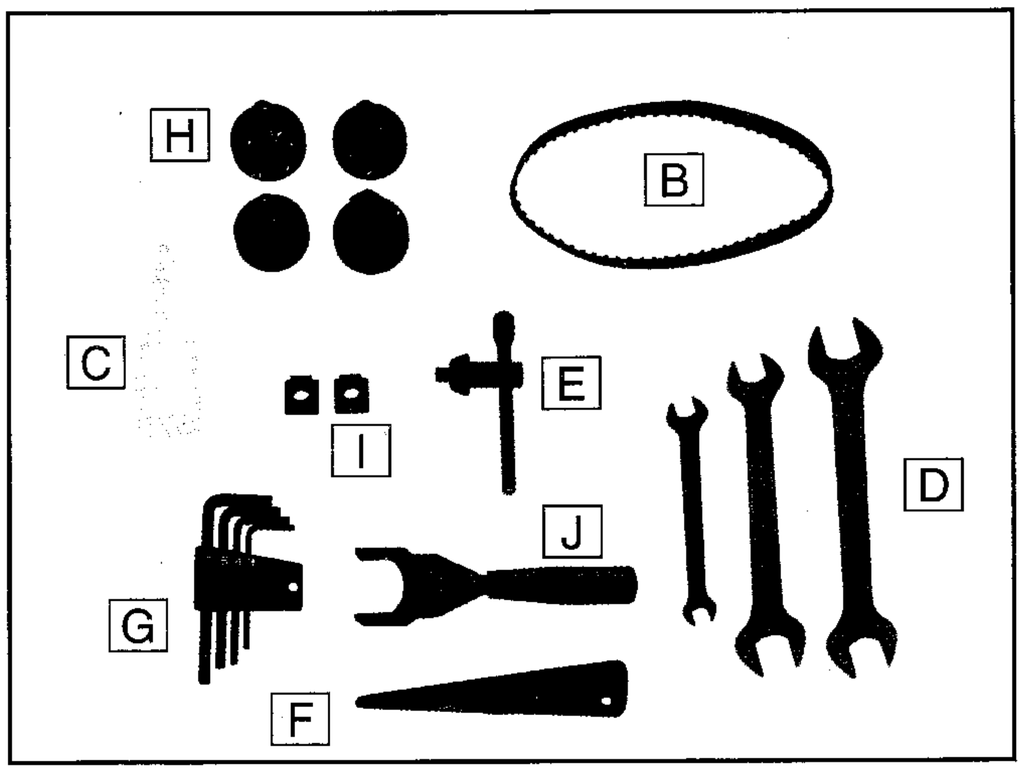


Figure 4. Loose inventory.

In the event that any nonproprietary parts are missing (e.g. a nut or a washer), we would be glad to replace them, or for the sake of expediency, replacements can be obtained at your local hardware store.

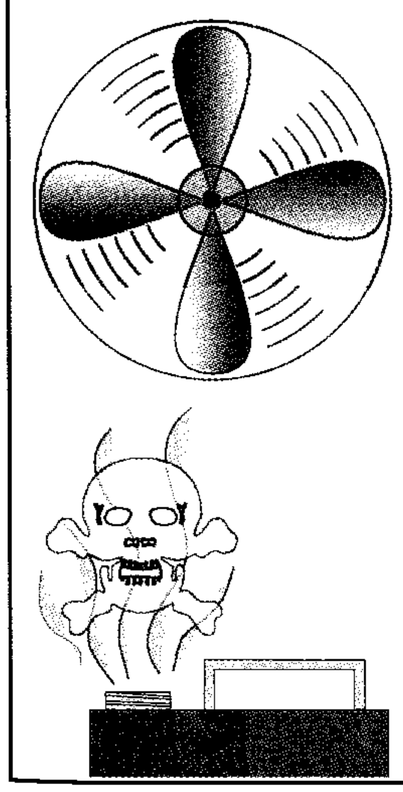
Clean Up

The unpainted surfaces are coated with a waxy oil to protect them from corrosion during shipment. Remove this protective coating with a solvent cleaner or citrus-based degreaser such as Grizzly's G7895 Degreaser. To clean thoroughly, some parts may need to be removed. **For optimum performance from your machine, make sure you clean all moving parts or sliding contact surfaces that are coated.** Avoid chlorine-based solvents, such as acetone or brake parts cleaner, as they may damage painted surfaces should they come in contact. Always follow the manufacturer's instructions when using any type of cleaning product.



⚠WARNING

Gasoline and petroleum products have low flash points and could cause an explosion or fire if used to clean machinery. DO NOT use gasoline or petroleum products to clean the machinery.



⚠CAUTION

Many of the solvents commonly used to clean machinery can be toxic when inhaled or ingested. Lack of ventilation while using these solvents could cause serious personal health risks or fire. Take precautions from this hazard by only using cleaning solvents in a well ventilated area.

Site Considerations

Workbench Load

Although adjustable feet are included with your mill/drill, It is strongly recommended you bolt your machine to a sturdy workbench that will not tip. Refer to the **Machine Data Sheet** for the weight and footprint specifications of your machine. Some workbenches may require additional reinforcement to support both the machine and the workpiece.

Working Clearances

Consider existing and anticipated needs, size of material to be processed through each machine, and space for auxiliary stands, work tables or other machinery when establishing a location for your new machine. See **Figure 5** for the minimum working clearances.

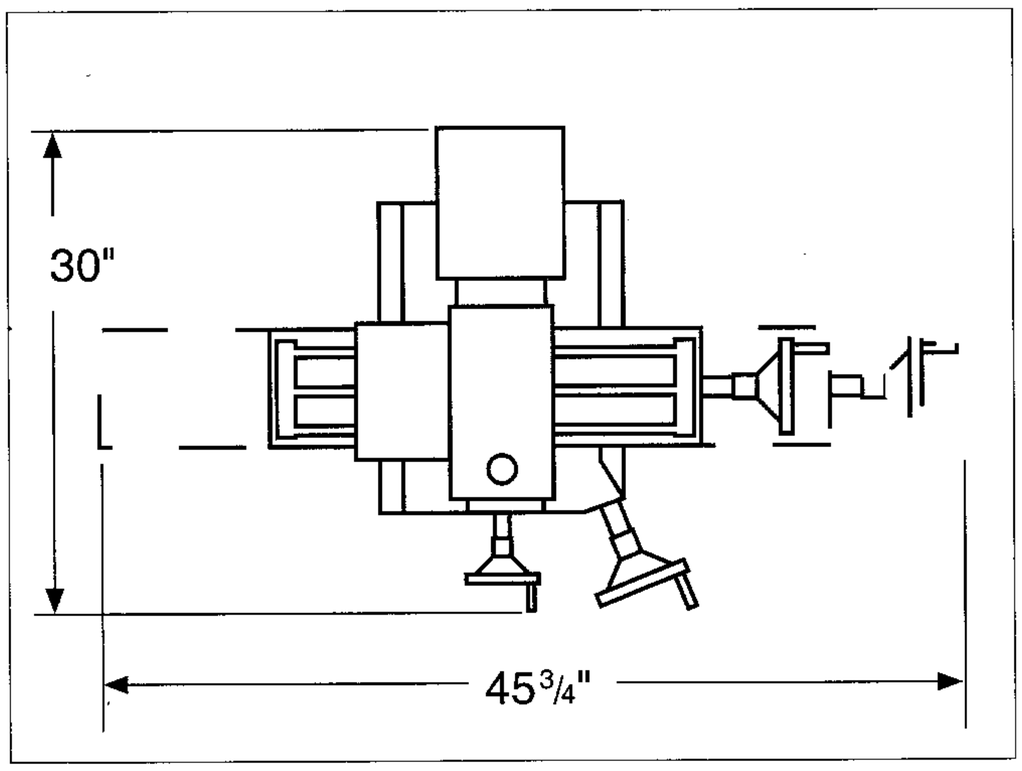
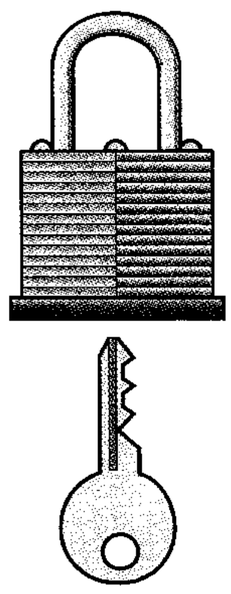


Figure 5. Minimum working clearances.



⚠CAUTION

Unsupervised children and visitors inside your shop could cause serious personal injury to themselves. Lock all entrances to the shop when you are away and DO NOT allow unsupervised children or visitors in your shop at any time!

Feet

Four leveling feet have been included with your mill/drill. However, we recommend bolting your machine to a sturdy workbench.

Components and Hardware Needed:	**Qty**
Feet with Hex Nut M12-1.75	4

To install the feet on the mill/drill:

1. With the help of an assistant, tip the mill/drill back to gain access to the underside of the base and thread the feet into the threaded holes.

2. Place your precision level on the mill/drill table.

3. Adjust the hex nut(s) until the mill/drill is level side-to-side and front-to-back as shown in **Figure 6.**

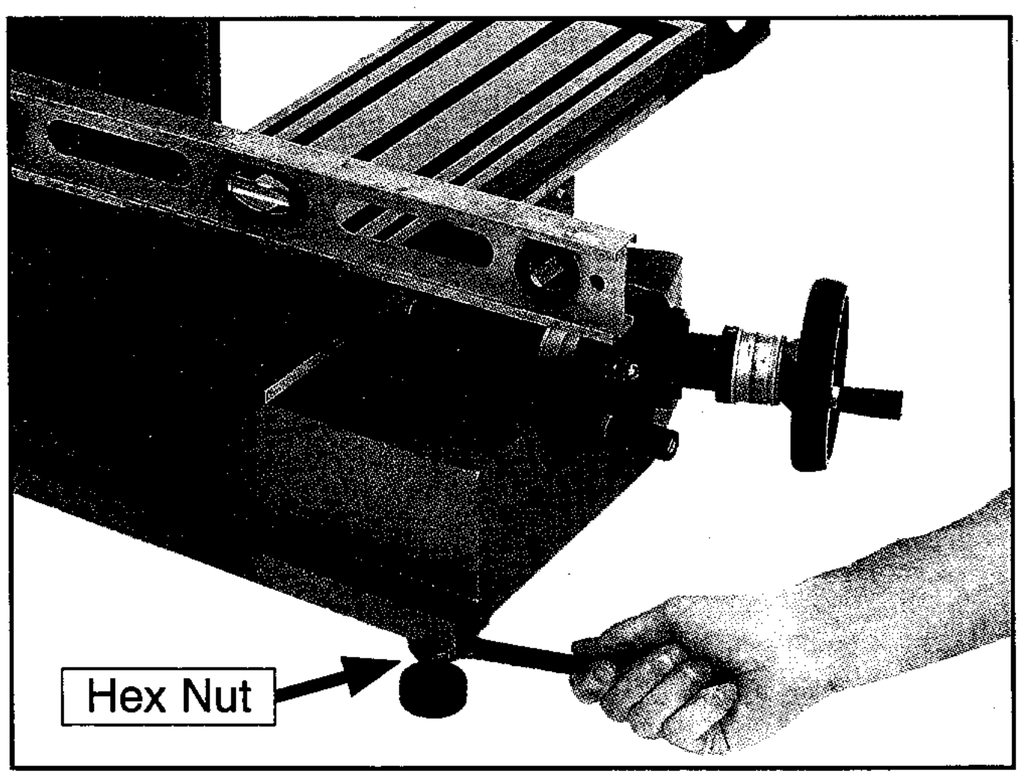


Figure 6. Leveling the mill/drill.

Mounting to Workbench

The Model G0463 should be bolted to a workbench to provide maximum rigidity and safety.

Components and Hardware Needed:	**Qty**
Hex Bolts M12-1.75 x (length as needed)	4
Flat Washers 12mm	8
Lock Washers 12mm	4
Hex Nuts M12-1.75	4

To mount the mill/drill to the workbench:

1. Determine the best position for the mill/drill on the workbench.

 Note: *For the best performance, make sure the cross feed and the longitudinal handwheels extend out beyond the edge of the table surface. This will allow unrestricted handwheel operation.*

2. Mark your hole locations using the mounting holes in the base as a guide.

3. Drill the holes needed in the workbench.

4. Place a precision level on the mill/drill table and shim the mill/drill until it is level side-to-side and front-to-back.

5. Bolt the mill/drill to the workbench.

Test Run and Spindle Break-in

The Model G0463 has two speed ranges: Low range is 0–1000; high range is 0–2000 RPM.

It is essential to closely follow the proper break-in procedures to ensure trouble free performance. Complete this process once you have familiarized yourself with all instructions in this manual.

To begin the start up and break-in procedure:

1. Follow all lubrication procedures highlighted in **Lubrication** in **Section 6: MAINTENANCE** on **Page 24.**

2. Make sure there are no obstructions around or underneath the spindle. Remove the drawbar if there is no arbor or collet in the spindle.

3. With the spindle at a complete stop, shift the HIGH/LOW gear change knob into the low range (see **Figure 7**). Set the forward/reverse switch to FWD.

 Note: *If the knob will not rotate into gear at first, rotate the spindle by hand while holding light pressure on the knob. When the gears engage, the knob will rotate into place.*



Figure 7. HIGH/LOW gear change knob.

4. Make sure all switches are ***OFF*** and connect the mill/drill to the power source.

5. Turn the main power switch ***ON*** & Spindle RPM control ***ON*** and let the mill run for a minimum of 10 minutes on a low speed. The mill/drill should run smoothly with minimal noise and vibration.

 —If you suspect the mill/drill is not working correctly, shut the mill/drill ***OFF*** and correct the problem before proceeding further.

 —If the mill/drill is running smoothly, proceed.

NOTICE

DO NOT attempt to change between high and low speed ranges with the spindle *ON.* Damage to the spindle gearing will occur.

6. Slowly increase the RPM and allow it to run at a medium RPM for another ten minutes.

7. Slowly increase the RPM and allow it to run at a high RPM for another ten minutes.

8. Turn the mill/drill ***OFF.*** Switch to the high range and repeat **Steps 4–6**.

9. Set the forward/reverse switch to REV and repeat the previous process.

NOTICE

Failure to follow start up and spindle break-in procedures will likely cause rapid deterioration of spindle and other related parts.

Drill Chuck Removal

The Model G0463 may have shipped with the drill chuck installed in the spindle. If this is the case, go ahead and remove the chuck and arbor at this time.

Tools Needed:	**Qty**
Brass Hammer	1
Pin Spanner	1
Wrench 17/19mm	1

To remove the chuck and arbor from the spindle:

1. UNPLUG THE MILL/DRILL!

2. Remove the plastic cap that covers the drawbar.

3. Lock the quill in place with the quill lock.

4. Insert the pin spanner into the two holes at the bottom of the spindle. This will keep the spindle from turning, and allow you to loosen the drawbar (see **Figure 8**).

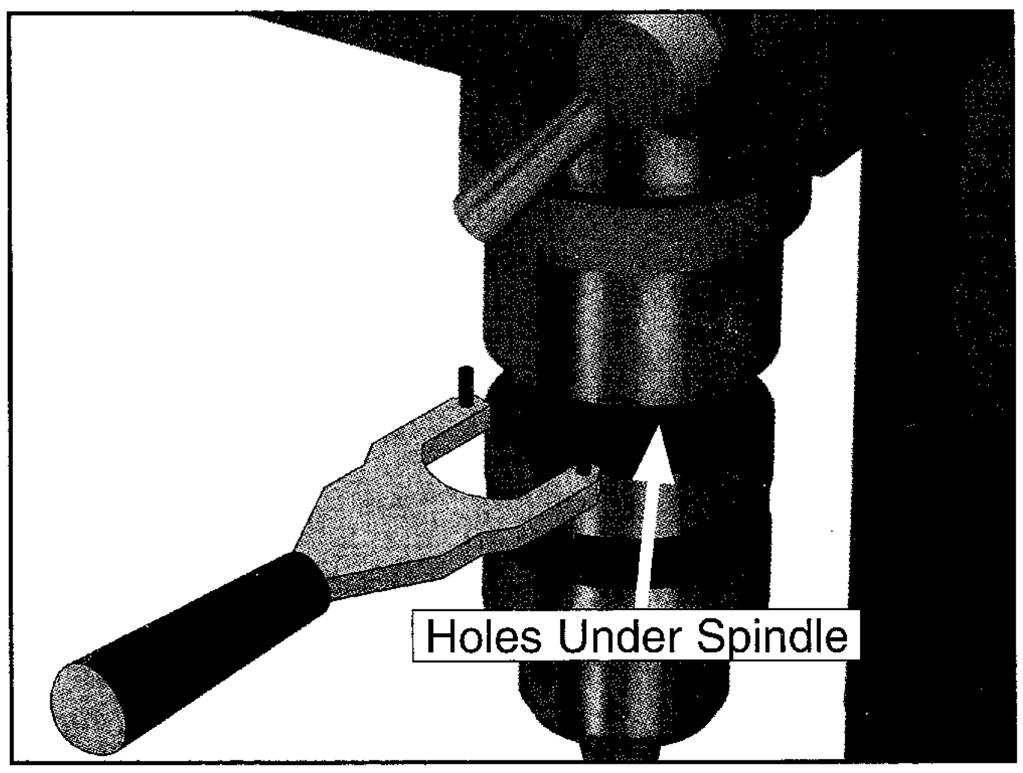


Figure 8. Spindle holes.

5. Using the 17mm wrench, loosen the drawbar but DO NOT remove it.

NOTICE

DO NOT completely unscrew the drawbar before striking it with the hammer. You will damage the threads on the drawbar and the arbor.

6. Tap the top of the drawbar with the hammer. This will unseat the taper of the arbor and the spindle (see **Figure 9**).

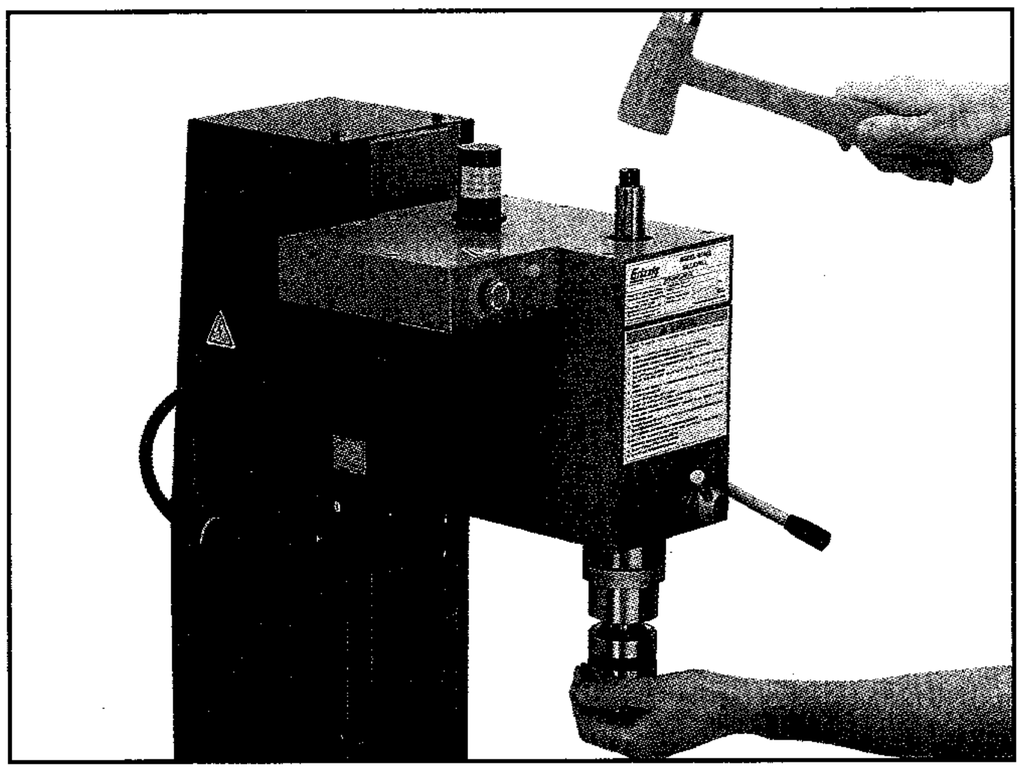


Figure 9. Striking the drawbar.

7. Hold one hand under the chuck and finish loosening the drawbar by hand until it falls out of the spindle.

 Note: *The chuck is attached to the arbor using a JT6 taper. This attachment is considered to be semi-permanent. There should be no need to remove the chuck from the arbor. Inspect the chuck from time to time to make sure it is still tight on the arbor. If it is loose, use an dead-blow or other soft headed hammer to re-seat the taper.*

R-8 Collets

The Model G0463 features an R-8 spindle taper, which only accepts R-8 collets. R-8 collets come in many sizes, typically ranging from 1/16" to 7/8" and 3mm to 20mm. You will need a collet to match the diameter of the shank of the tool you want to hold.

To install the R-8 collet:

1. UNPLUG THE MILL/DRILL!
2. Remove the drawbar cap.
3. Carefully clean the surface of the collet and spindle taper. Ensure that it is free of debris, oil and grease of any kind.
4. Insert the cutting tool into the collet.
5. Insert the collet up into the spindle taper.
6. Slide the collet the rest of the way in until it makes contact with the threads at the end of the drawbar.
7. Using your fingers, thread the drawbar into the collet until the collet draws up into the spindle taper.
8. While supporting the tool in the collet with one hand, tighten the drawbar with the 17mm wrench in your opposite hand.

Note: *Do not overtighten the drawbar. Overtightening makes collet removal difficult and causes damage to the drawbar threads, collet, and the spindle taper. Keep in mind the taper keeps the collet and tool in place. The drawbar simply aids in seating the taper.*

To remove the collet:

1. UNPLUG THE MILL/DRILL!
2. Tighten the headstock lock.



⚠CAUTION

LACERATION HAZARD! Leading edges of end mills and other cutting tools can be very sharp. Protect your hands with gloves or a shop towel when handling.

3. Protect the table surface with a piece of cardboard or hold the cutter or tool with a shop towel to prevent it from falling out of the collet.
4. Using the 17mm wrench, loosen the drawbar but DO NOT remove it.

NOTICE

DO NOT completely unscrew the drawbar before striking it with the hammer. You will damage the threads on the drawbar and the arbor.

5. Using the brass hammer, tap the drawbar to unseat the taper.
6. Unscrew the rest of the drawbar by hand and remove the collet.

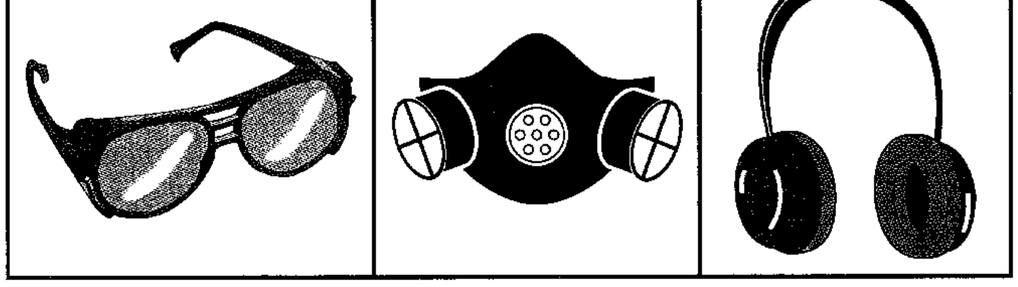
Note: *When not in use, always remove collets and cutting tools from the spindle taper. Oxidation may cause the collet to seize and make it hard to remove later.*

SECTION 4: OPERATIONS

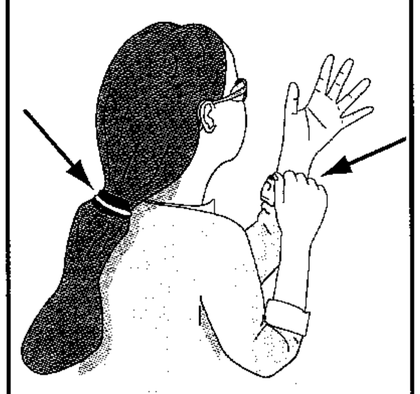
Operation Safety

⚠WARNING

Damage to your eyes, lungs, and ears could result from using this machine without proper protective gear. Always wear safety glasses, a respirator, and hearing protection when operating this machine.



⚠WARNING



Loose hair and clothing could get caught in machinery and cause serious personal injury. Keep loose clothing and long hair away from moving machinery.

NOTICE

If you have never used this type of machine or equipment before, WE STRONGLY RECOMMEND that you read books, trade magazines, or get formal training before beginning any projects. Regardless of the content in this section, Grizzly Industrial will not be held liable for accidents caused by lack of training.

Power Controls

It is vital that you become familiar with the power controls before operating the Model G0463. Three separate switches control the power on the mill/drill (see **Figure 10**).

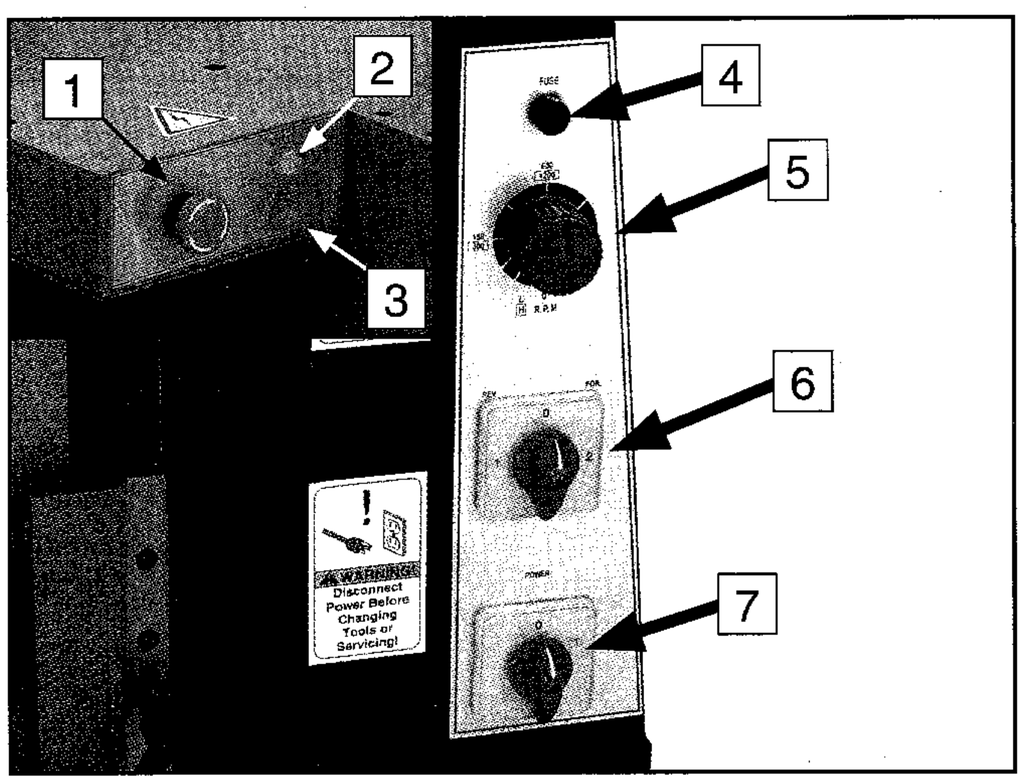


Figure 10. Control panel components.

1. EMERGENCY STOP Button: Immediately disconnects power to the system. Once pressed, this button must be twisted until it pops out to return power to the switches. The FAULT INDICATOR Light will turn on and the MAIN POWER Switch needs to be turned OFF.

2. FAULT INDICATOR Light: Indicates a circuit interruption due to a switch being out of proper position. Turn all switches OFF when lit.

3. POWER INDICATOR Light: Shines when the system power is ON.

4. Fuse Socket: Houses a 10 Amp system fuse.

5. SPINDLE RPM Control Knob: Turns the spindle ***ON*** and controls the spindle RPM in both speed ranges.

6. FORWARD/NEUTRAL/REVERSE Switch. Changes spindle rotational direction.

7. MAIN POWER Switch: This switch delivers power to the system.

Power Shutdown

It is important to shut the power ***OFF*** when the mill/drill is not in use. Leaving the power ***ON*** keeps the circuit board cooling fan running. This will cause unnecessary wear on the fan and electrical system.

To completely shut the system power *OFF:*

1. Turn the SPINDLE RPM Control Knob OFF.

2. Turn the MAIN POWER Switch OFF.

3. Press the EMERGENCY STOP Button. At this point the green power light and the amber fan power light should not be lit.

Spindle & Headstock Controls

The Model G0463 spindle height is controlled like a drill press (see **Figure 11**).

To use the rapid downfeed:

1. Make sure the quill lock is released and the headstock is locked in position.

2. Turn the quill feed levers to lower and raise the spindle.

 Note: *For maximum rigidity and accuracy when milling, keep the spindle retracted and locked inside the head as far as possible.*

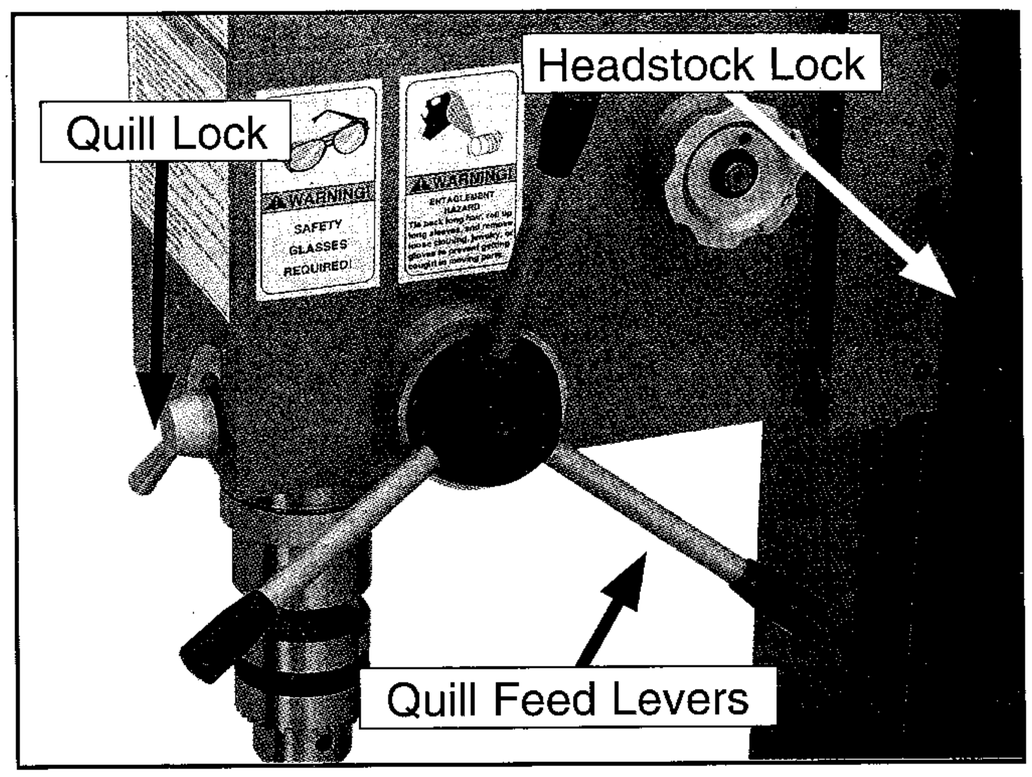


Figure 11. Spindle controls.

The headstock moves on the column in the vertical (Z) axis and is controlled by a handwheel.

To move the headstock:

1. Unlock the headstock lock.

2. Turn the vertical (Z) axis handwheel shown in **Figure 12** to raise and lower the headstock.

 Note: *For maximum rigidity and accuracy when milling, make sure you keep the headstock locked in position.*

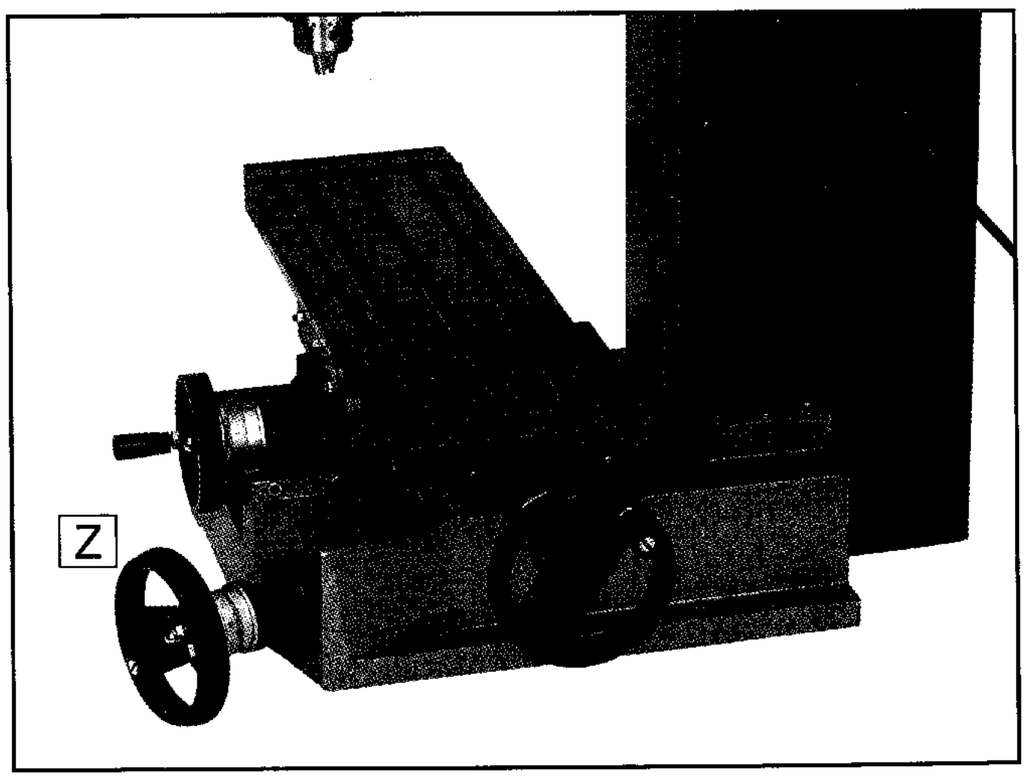


Figure 12. Z axis control.

Table Travel

The mill/drill table can be moved in the X and Y axis.

Longitudinal Feed
The longitudinal feed or (X-axis) is moved by a handwheel in **Figure 13** at the end of the table. The handwheel will move the table in both directions side-to-side. One complete revolution of the handwheel moves the longitudinal feed 0.100". There is also a scale on the front of the table for use when a tight tolerance is not required. The longitudinal feed can be locked in position by a table lock located on the front of the table (see **Figure 14**).

Cross Feed
The cross feed or (Y-axis) in **Figure 13**, is moved with the handwheel on the front of the table base. One complete revolution of the handwheel moves the cross slide 0.100". The cross feed can be locked into position by a table lock located on the right side of the cross slide underneath the table (see **Figure 14**).

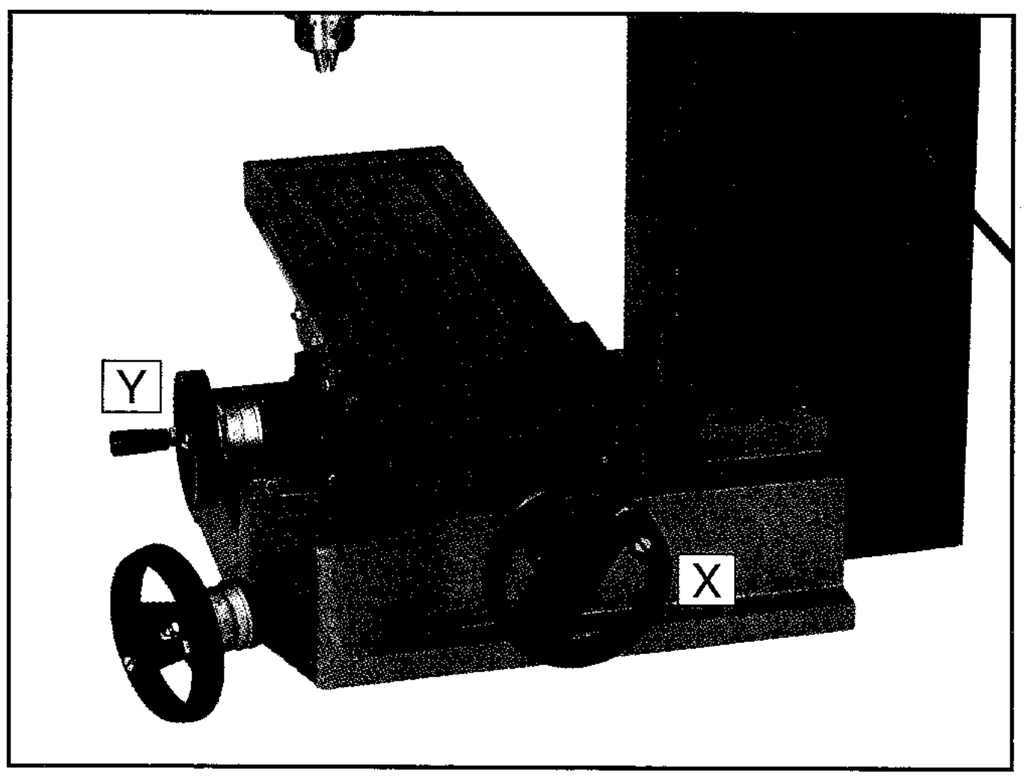


Figure 13. X & Y Handwheels.

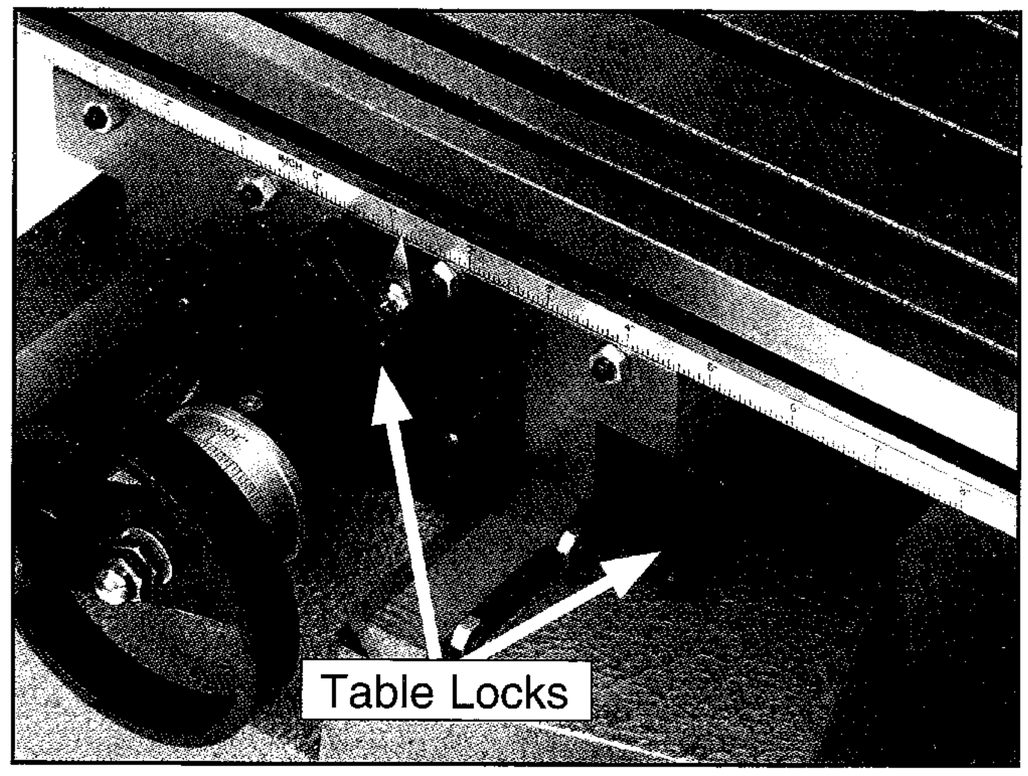


Figure 14. Table locks.

Setting RPM

Closely follow the proper cutting speed and proper feed to reduce undue strain on all moving parts and for operator safety.

Prior to machining, you need to determine the RPM needed to cut your workpiece, and then set the RPM on the machine.

To determine the needed RPM:

1. Use the table in **Figure 15** to determine the cutting speed required for the material of your workpiece.

2. Measure the diameter of your cutting tool in inches.

3. Use the following formula to determine the needed RPM for your operation:

 (Cutting Speed x 4) /Tool Diameter = RPM

Cutting Speeds for High Speed Steel (HSS) Cutting Tools	
Workpiece Material	Cutting Speed (sfm)
Aluminum & alloys	300
Brass & Bronze	150
Copper	100
Cast Iron, soft	80
Cast Iron, hard	50
Mild Steel	90
Cast Steel	80
Alloy Steel, hard	40
Tool Steel	50
Stainless Steel	60
Titanium	50
Plastics	300-800
Wood	300-500
Note: For carbide cutting tools, double the cutting speed. These values are a guideline only. Refer to the *MACHINERY'S HANDBOOK* for more detailed information.	

Figure 15. Cutting speed table for HSS cutting tools.

⚠WARNING

Failure to follow RPM and Feed Rate Guidelines may threaten operator safety from ejected parts or broken tools.

NOTICE

Failure to follow RPM and Feed Rate Guidelines will put undue strain on moving parts, shorten tool life, and create poor workpiece results.

SECTION 5: ACCESSORIES

G9765—9-PC. Ball End Mill Set
Features 2 flute ball nose end mills. Includes the following sizes: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8" and 3/4".

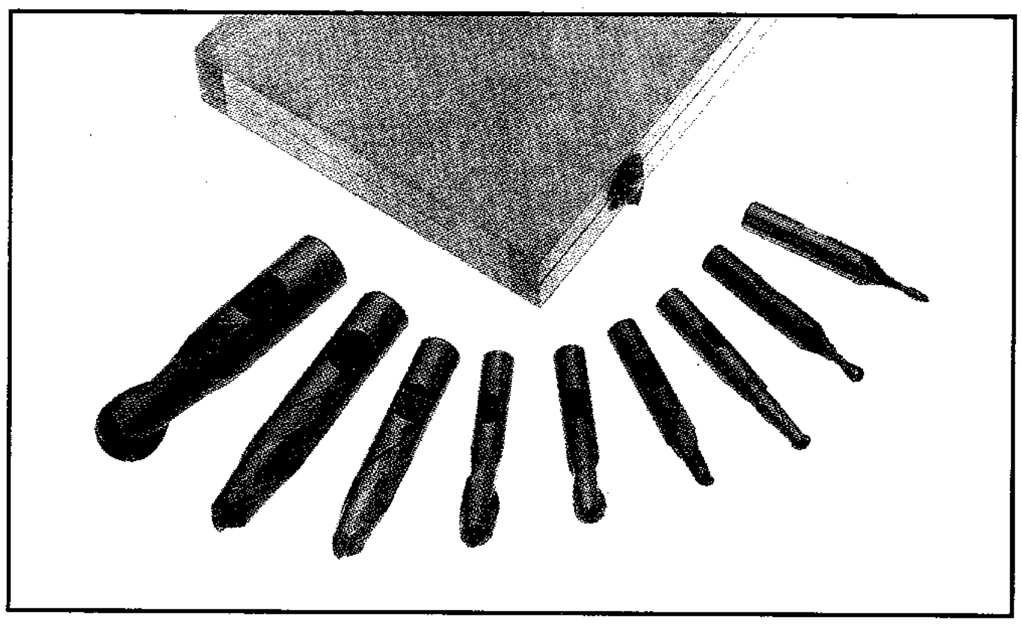


Figure 16. G9765 9 PC. Ball End Mill Set.

G9610—Test Indicator
.03" Range/.001" Resolution
G9611—Test Indicator
.008" Range/.0001" Resolution
G9612—Test Indicator
.030" Range/.0005" Resolution
These test indicators have an easy to read dial and a pivoting stylus that moves at right angles to the dial face.

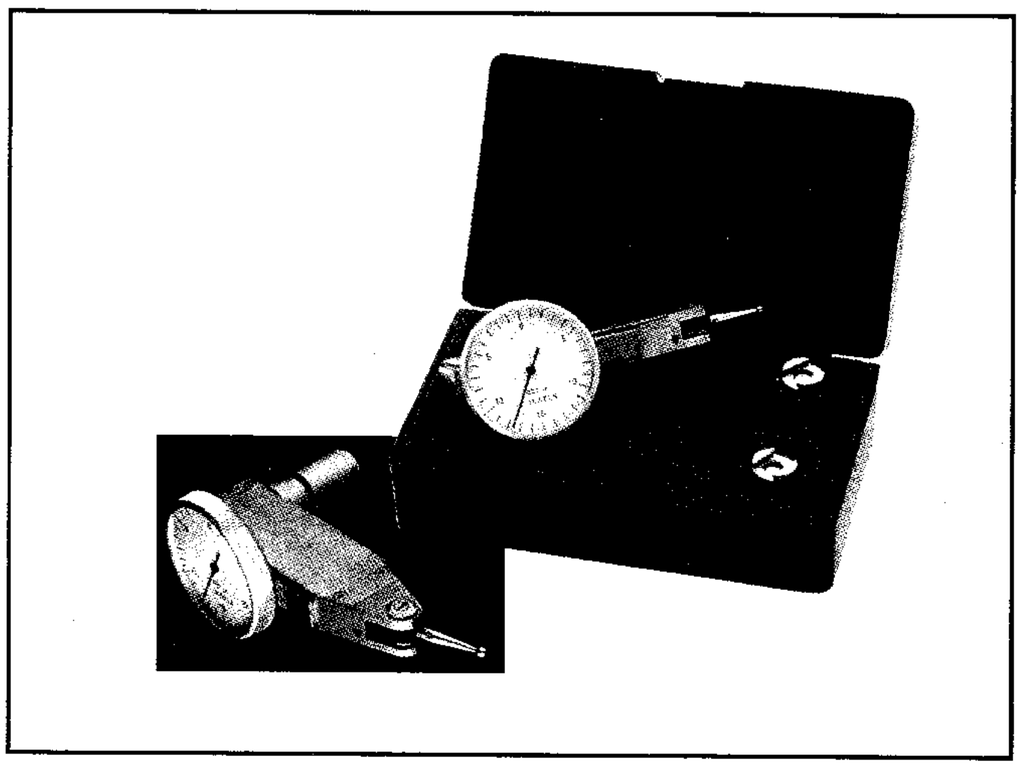


Figure 17. Test Indicator.

H3022—Measurement Tool Set
Includes magnetic base, 1" dial indicator (.001"), and 6" dial caliper (.001"). The extremely low price has made this a very popular seller!

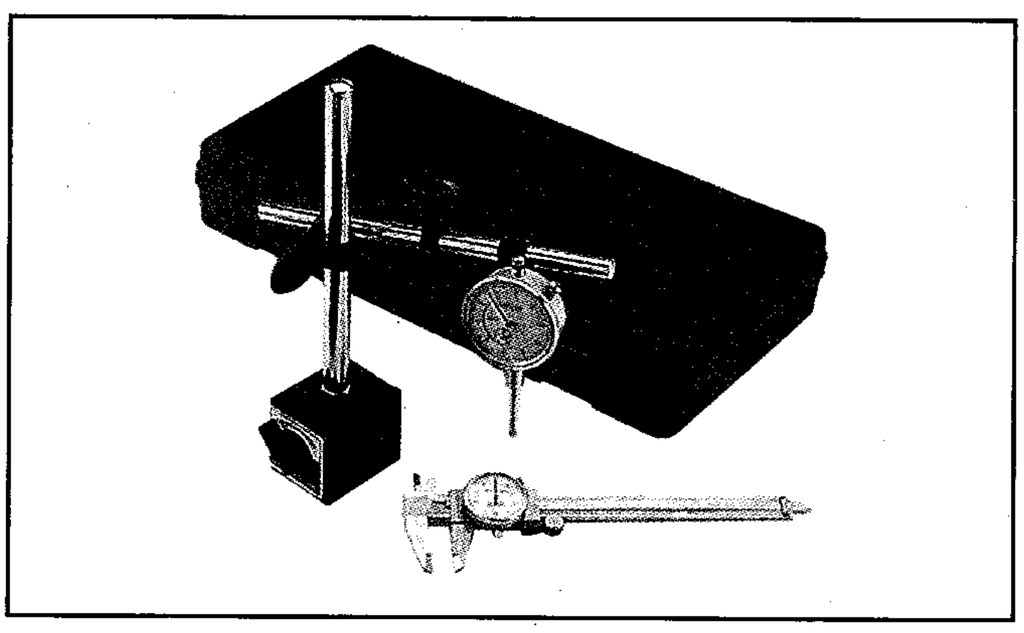


Figure 18. H3022 Measurement Tool Set.

G9002—2½" Swivel Base Milling Vise
G5971— 3½" Swivel Base Milling Vise
G5972—4" Swivel Base Milling Vise
G5973—5" Swivel Base Milling Vise
G5974—6" Swivel Base Milling Vise
G5975—8" Swivel Base Milling Vise
Vises feature 360° rotation with fine graduations, drop forged handle, precision ground jaw faces, enclosed acme screw and detachable swivel base.

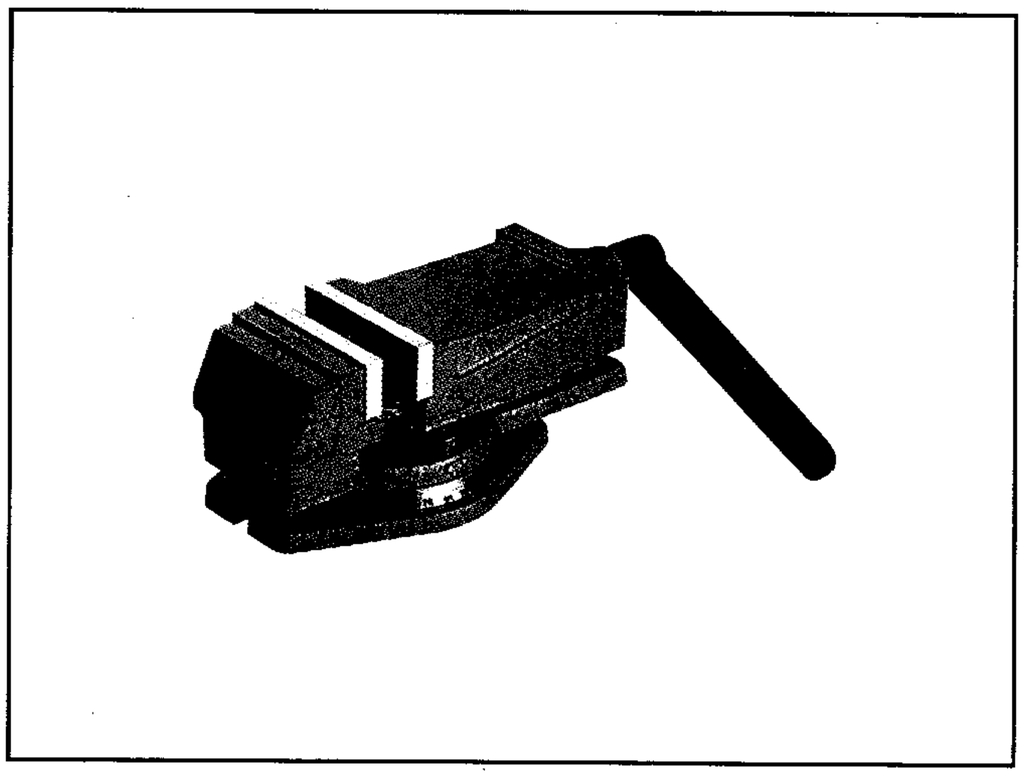


Figure 19. Swivel base milling vise.

Call 1-800-523-4777 To Order

G9324—Boring Head Combo Set

Hardened and ground adjusting screws along with a wide base design guarantee a long life and trouble-free use. Includes a 3" boring head, R-8 arbor with 1½"-18 TPI, and a 12 piece ¾" boring bar set.

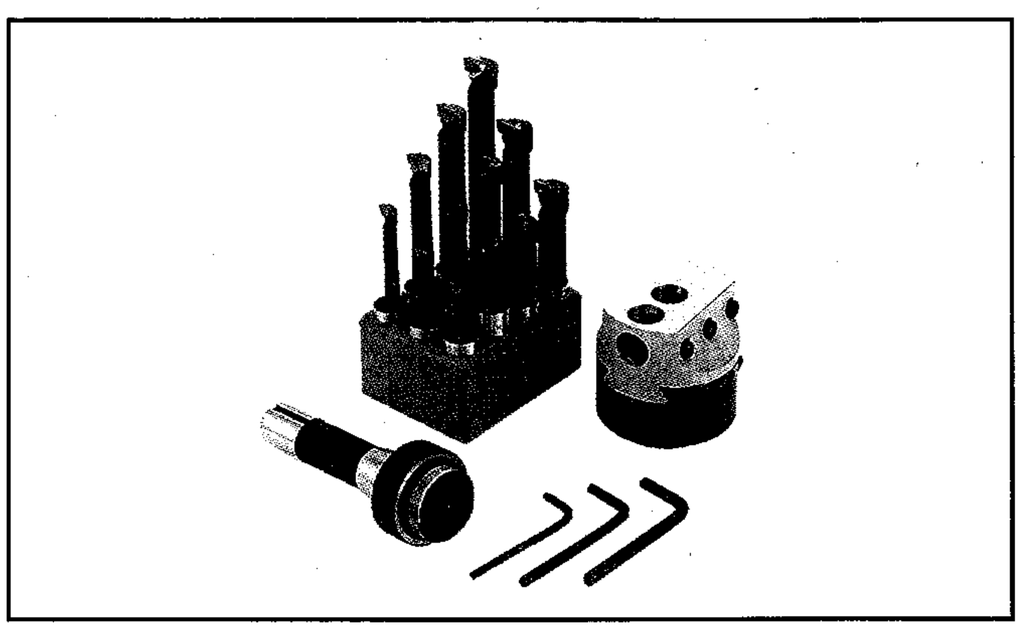


Figure 20. G9324 Boring Head Combo Set.

G2861—2½" Face Mill

This 2½" Face Mill accepts four carbide inserts. Comes with an R-8 arbor.

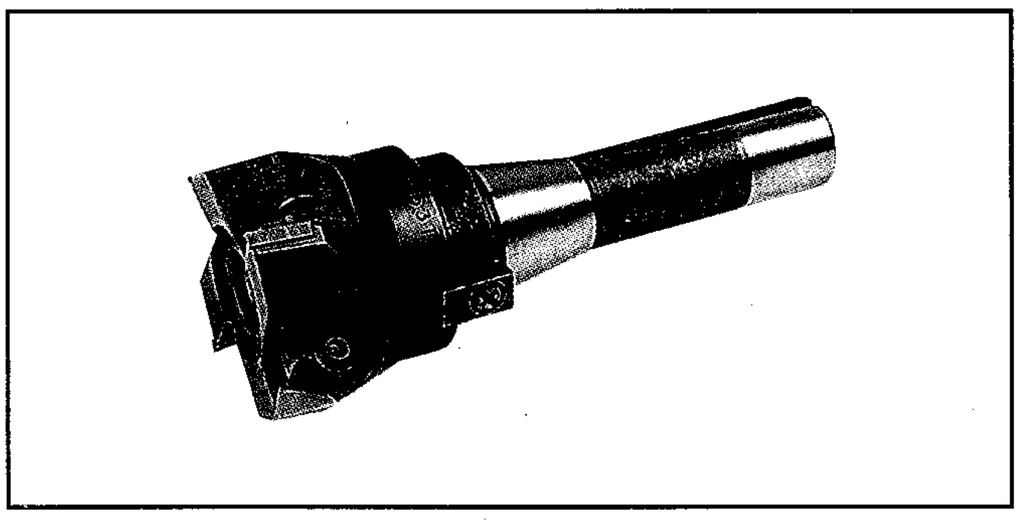


Figure 21. G2861 Face mill.

G9760—20-PC. 2 & 4 Flute TiN End Mill Set.

Includes these sizes and styles in two and four flute styles: 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 9/16", 5/8", 3/8", 11/16", and 3/4".

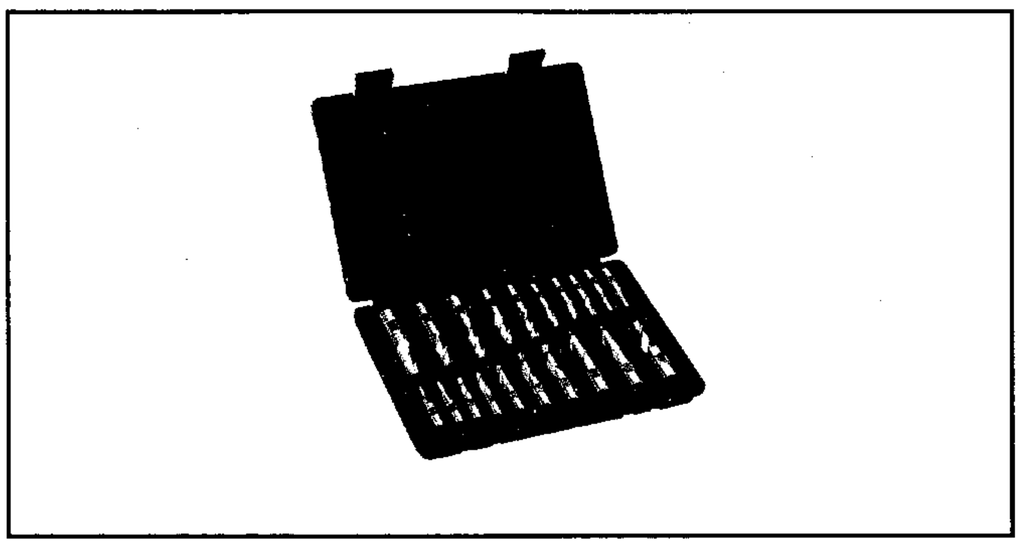


Figure 22. G9760 20-PC End Mill Set.

H2689—R-8 Quick Change Collet Set

An affordable quick change collet system with ultra precision. These spring collets are hardened and ground to exacting tolerances and offer incredible holding power. This set includes an R-8 arbor and nut, spanner wrench, plastic carrying case and collets sized 1/8", 1/4", 3/8", 1/2", 5/8", 3/4", 7/8", and 1". What's more, the nut features a self-ejecting rim! A set like this will truly speed up any tool changing process. Drawbar size is 7/16" x 20.

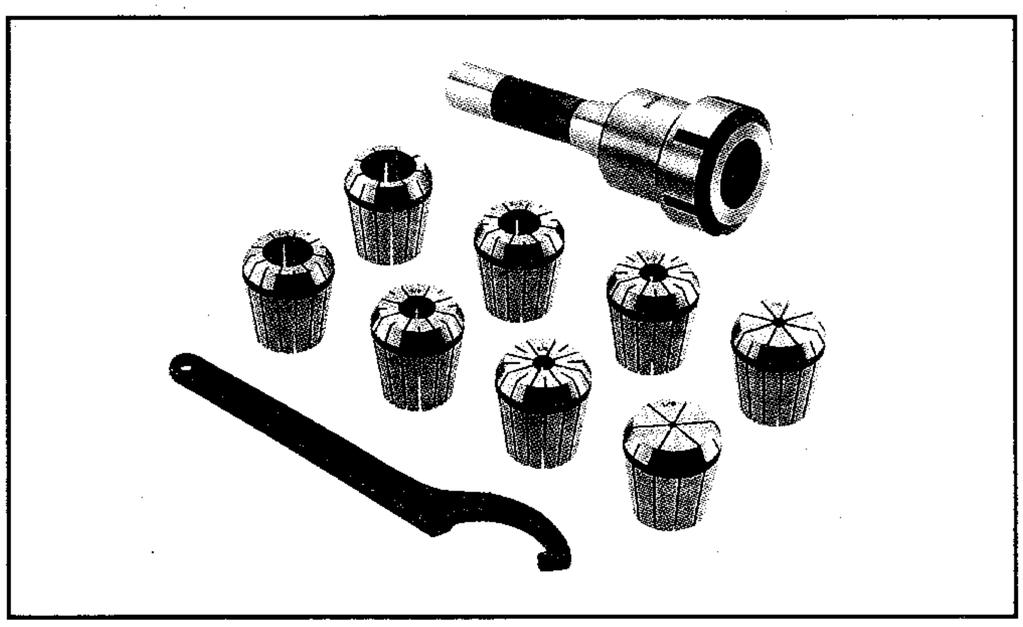


Figure 23. H2689 R-8 Quick Change Collet Set.

H5685—4" Rotary Table

The perfect rotary table for all you model makers and those doing smaller precision work. Comes with clamping kit.

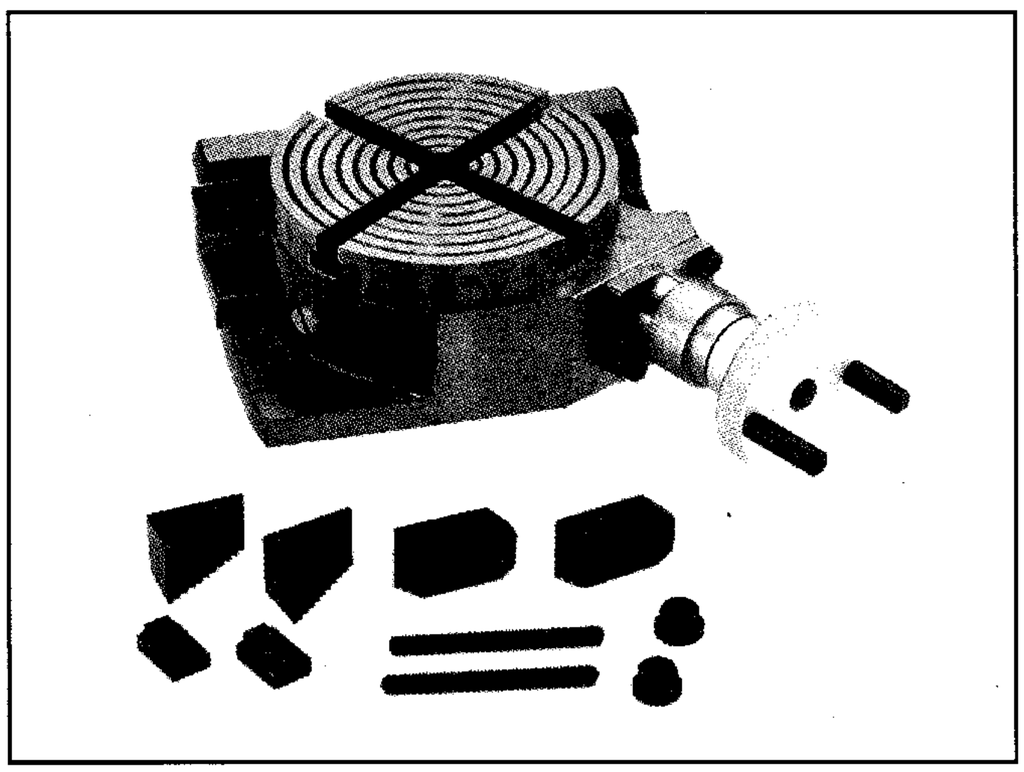
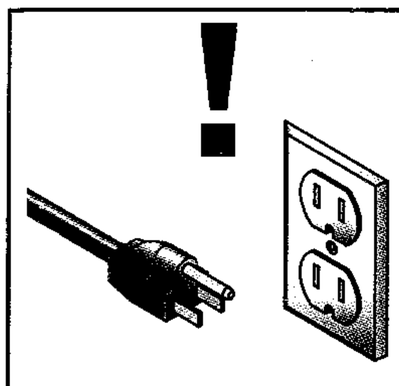


Figure 24. H5685 4" Rotary Table.

Call 1-800-523-4777 To Order

SECTION 6: MAINTENANCE



⚠WARNING
Always disconnect power to the machine before performing maintenance. Failure to do this may result in serious personal injury.

Schedule

For optimum performance from your machine, follow this maintenance schedule and refer to any specific instructions given in this section.

Daily Check:
- Mill/drill is completely powered down at the end of use.
- Excess cutting fluids and chips have been removed and unpainted surfaces are dry and protected.
- Loose mounting bolts.
- Mill/drill is clean and lubricated.
- Worn or damaged wires.
- Any other unsafe condition.

Monthly Check:
- Gibs are adjusted properly.

Unpainted Cast Iron

Protect the unpainted cast iron surfaces on the table by removing vises and fixtures daily and by wiping the table clean after every use—this ensures moisture does not remain on bare metal surfaces.

Keep tables rust-free with regular applications of products like G96® Gun Treatment, SLIPIT®, or Boeshield® T-9 (see **SECTION 5: ACCESSORIES** on **Page 22** for more details).

Lubrication

Regular lubrication will ensure your mill/drill performs at its highest potential (see **Figures 25** & **26**).

Place two to three drops of ISO 68 or SAE 20W non-detergent oil or similar lubricant directly on the ways of the cross slide and saddle. An oil bottle has been provided for this purpose.

Oil fittings are located on the tops of each handwheel and one on each side where the headstock meets the column. These should be lubricated daily with several drops oil.

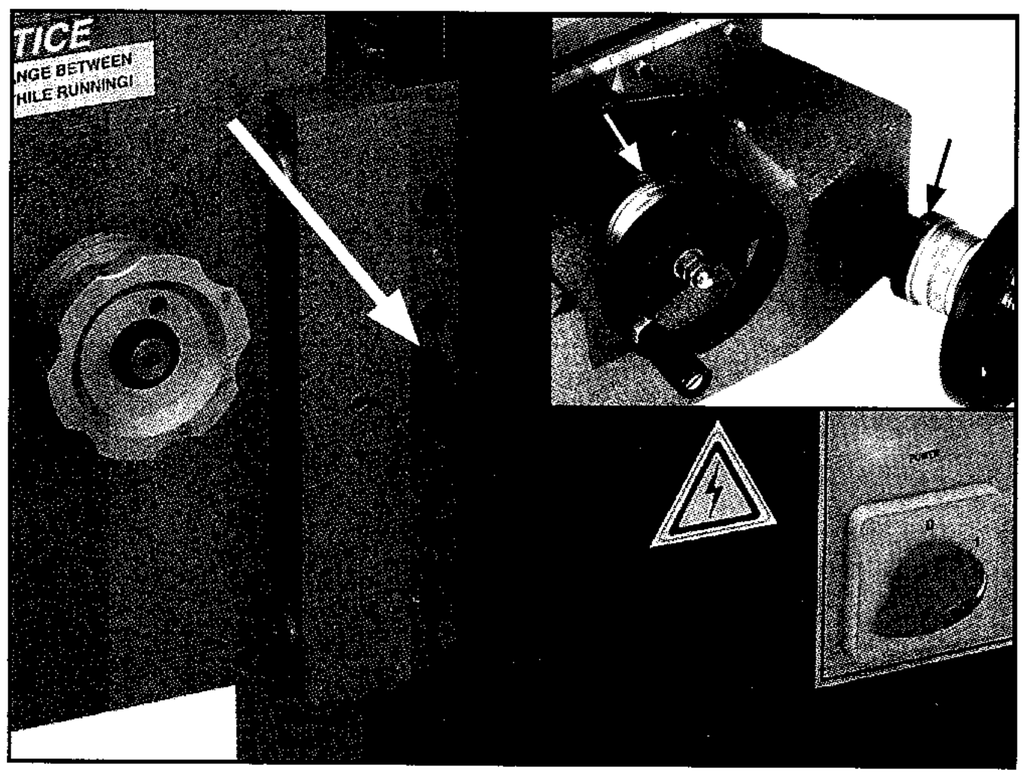


Figure 25. Column lubrication.

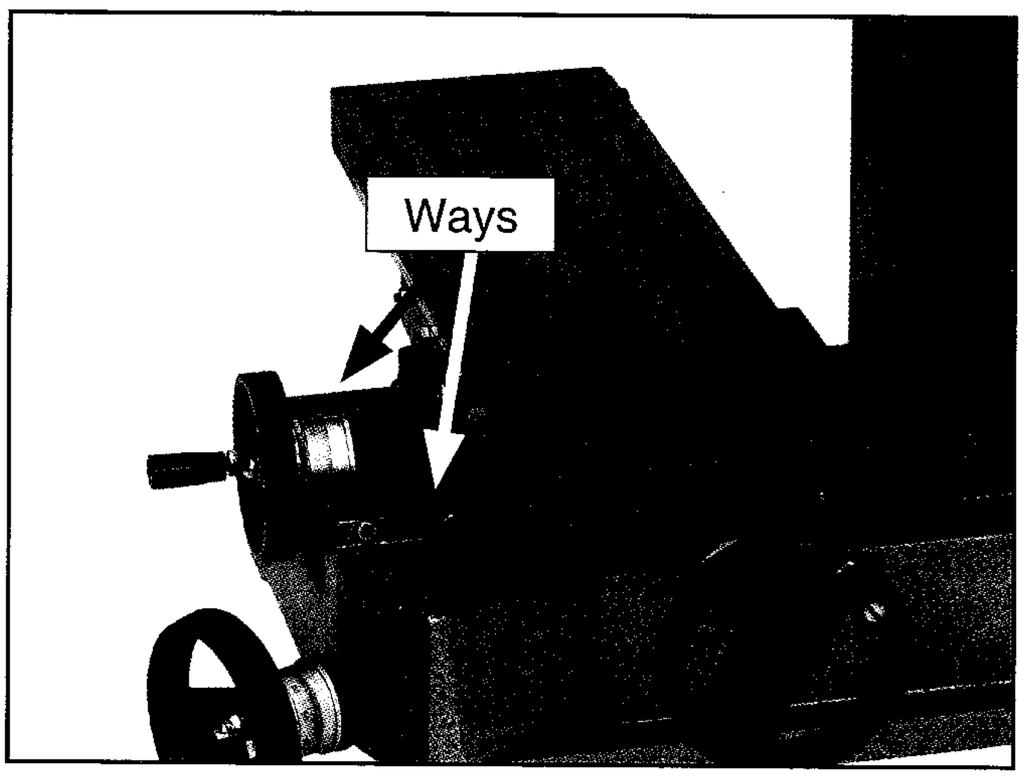


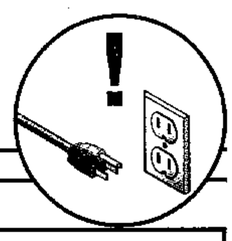
Figure 26. Table lubrication.

SECTION 7: SERVICE

About Service

Review the troubleshooting and procedures in this section to fix your machine if a problem develops. If you need replacement parts or you are unsure of your repair skills, then feel free to call our Technical Support at (570) 546-9663.

Troubleshooting



Symptom	Possible Cause	Possible Solution
Motor will not start.	1. E-Stop button is pressed. 2. Open circuit in motor or loose connections. 3. Blown system fuse.	1. Twist E-Stop until in pops out. 2. Inspect all lead connections on motor for loose or open connections. 3. Replace fuse.
Motor will not start; fuses or circuit breakers blow.	1. Short circuit in line cord or plug.	1. Repair or replace cord or plug for damaged insulation and shorted wires.
Motor shuts off unexpectedly.	1. Motor is overloaded due to high feed rate. 2. Thermal protection unit is overheated.	1. Reduce feed rate and amount of material removed. 2. Wait for system to cool down.
Motor overheats.	1. Motor overloaded. 2. Air circulation through the motor restricted. 3. Motor brushes are wearing.	1. Reduce load on motor. 2. Clean out motor to provide normal air circulation. 3. Inspect motor brushes, replace if necessary.
Motor stalls (resulting in blown fuses or tripped circuit).	1. Short circuit in motor or loose connections. 2. Low voltage. 3. Incorrect fuses or circuit breakers in power line. 4. Motor overloaded.	1. Repair or replace connections on motor for loose or shorted terminals or worn insulation. 2. Correct the low voltage conditions. 3. Install correct fuses or circuit breakers. 4. Reduce load on motor.
Cutter slows when cutting.	1. Brushes worn.	1. Replace brushes (**Page 30**).
Poor surface finishes.	1. Feed rate to fast. 2. Dull cutter. 3. Lock not tightened down. 4. Gibs loose.	1. Slow feed rate. 2. Always use newly sharpened cutters. 3. Tighten column and table locks when possible to maintain rigidity. 4. Adjust gibs.
Vibration when running or cutting.	1. Loose table. 2. Loose gibs. 3. Feed rate too high.	1. Tighten table locks. 2. Adjust gibs. 3. Slow feed rate or adjust RPM.
Difficulty removing collet from spindle.	1. Debris in spindle taper or collet taper or both. 2. Head not locked in position.	1. Keep all taper surfaces spotlessly clean. 2. Lock head in place on column.

Adjusting Gibs

The function of the gibs is to take out play in the table, and cross slide, and column without causing the slides to bind. The gibs are pre-adjusted at the factory and should not need further adjustment until many hours of machine use. If the movement seems too tight at first, make sure the locks are fully released. Next, make sure the bedways are thoroughly cleaned of rust preventative and lubricated with oil.

Tools Needed:	**Qty**
Wrench 10mm	1
Hex Wrench 3mm	1

Each gib has multiple lock nuts and set screws that need to be adjusted. Make your adjustments equally and in small increments.

To adjust the gibs: (see Figure 27)

1. UNPLUG THE MILL/DRILL!
2. Loosen the lock nuts.
3. Move the table and slightly tighten each set screw. When properly adjusted, the gib should offer slight resistance without binding.
4. Tighten the lock nuts.

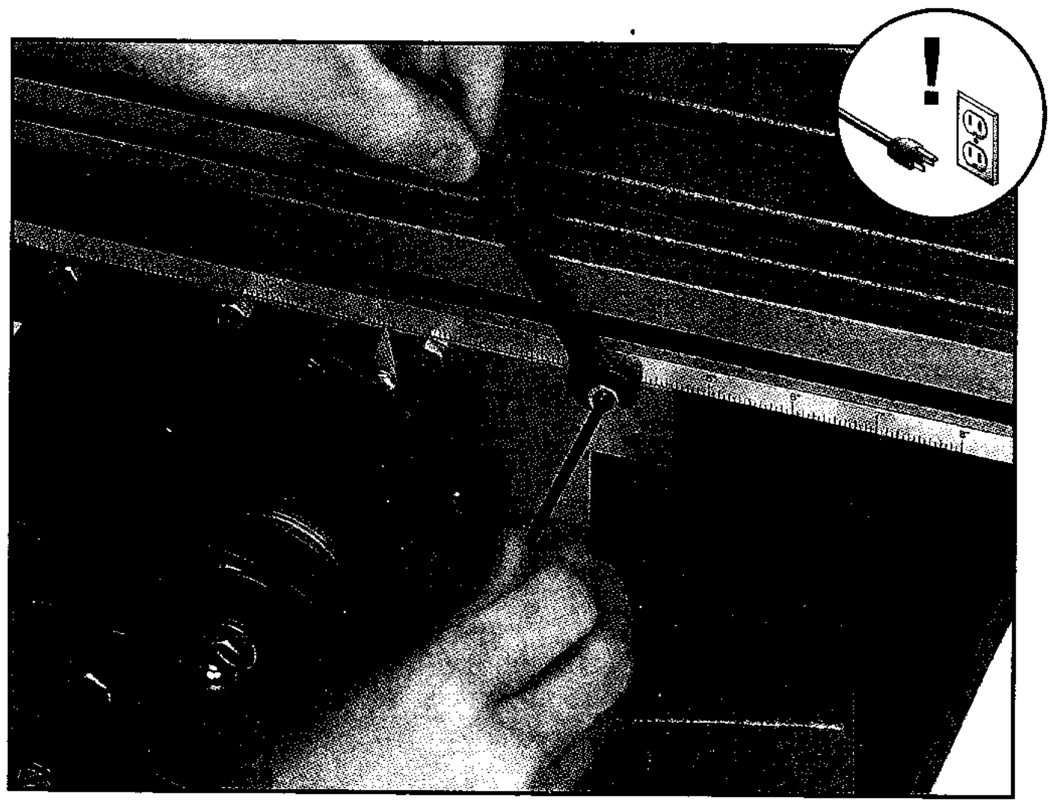


Figure 27. Gib adjustment.

Replacing Motor Brushes & Fuse

After some period of time, the carbon brushes on the DC motor will need to be replaced. Always replace the brushes in pairs. Use part # P0463242.

To replace the motor brushes:

1. UNPLUG THE MILL/DRILL!
2. Remove and replace the spring and carbon brush.

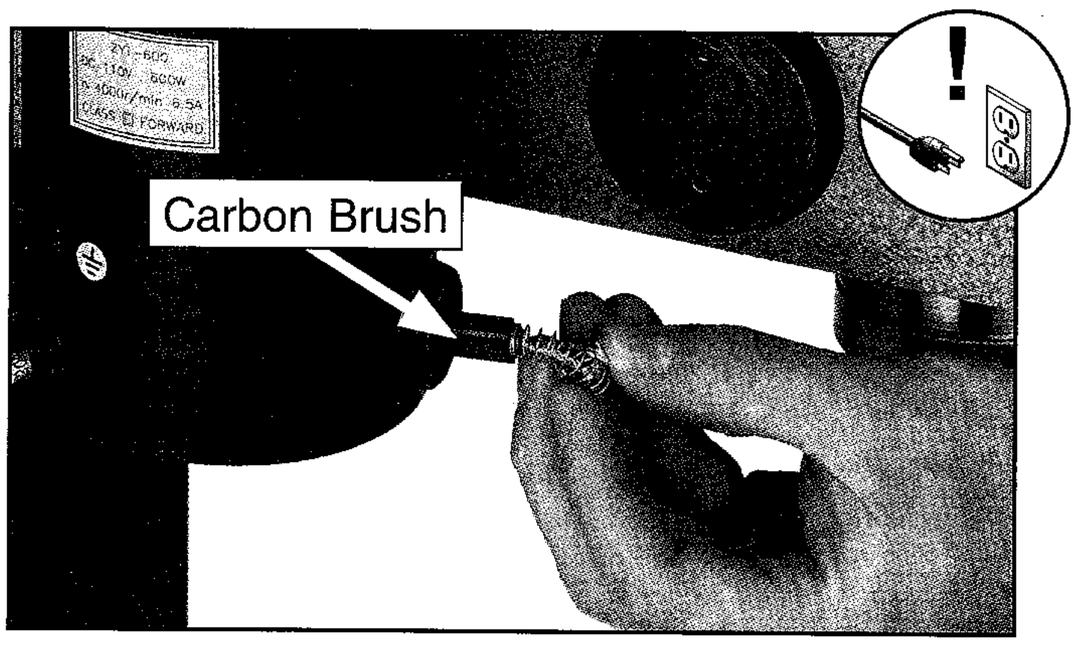


Figure 28. Carbon brush removal.

A 10 Amp fuse is housed in the body near the main controls.

To replace the fuse:

1. UNPLUG THE MILL/DRILL!
2. Remove and replace the fuse from the fuse cradle (see **Figure 29**).

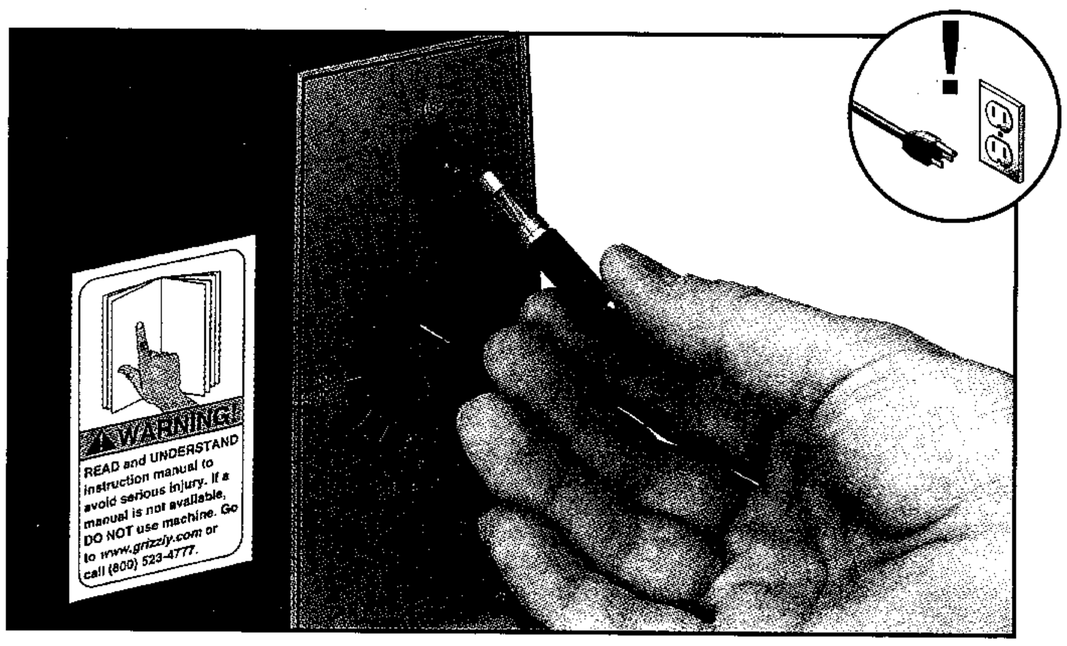


Figure 29. Fuse replacement.

Electrical Components

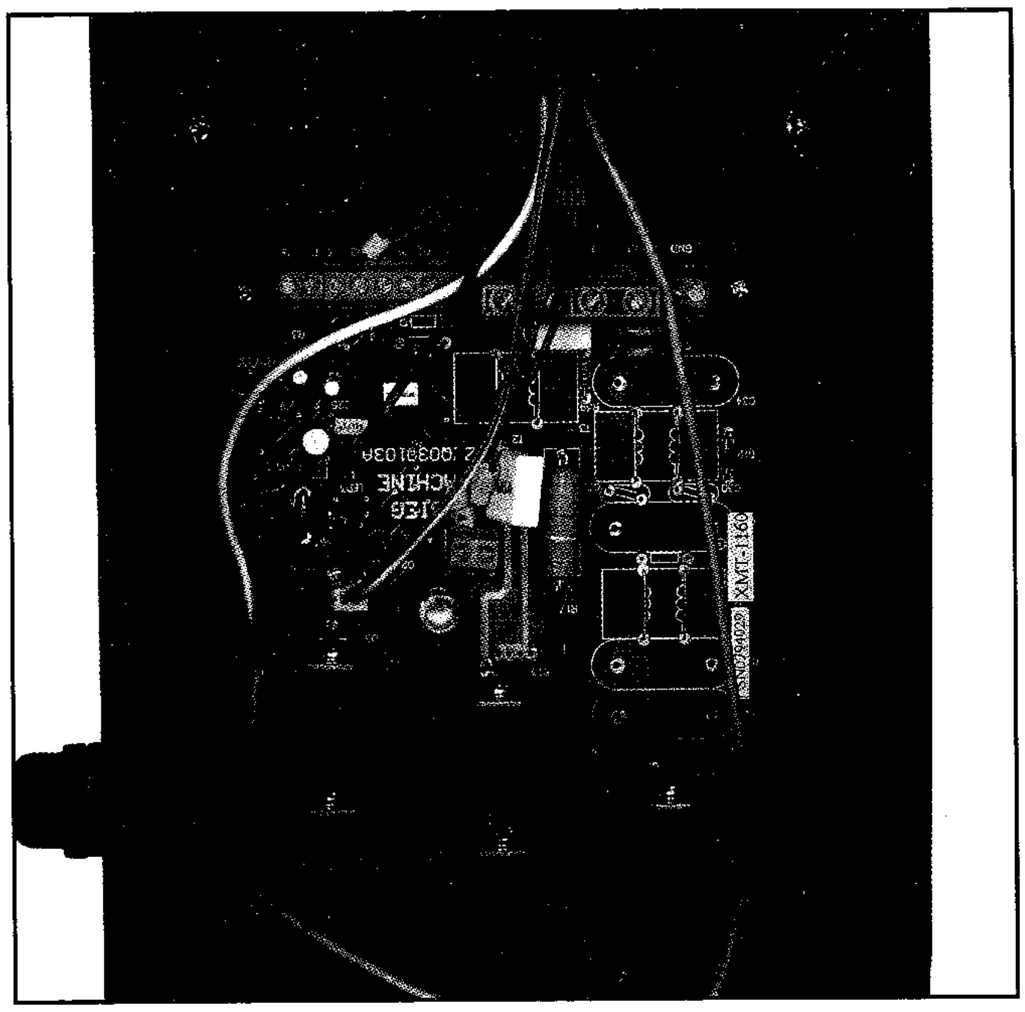


Figure 30. Circuit board.

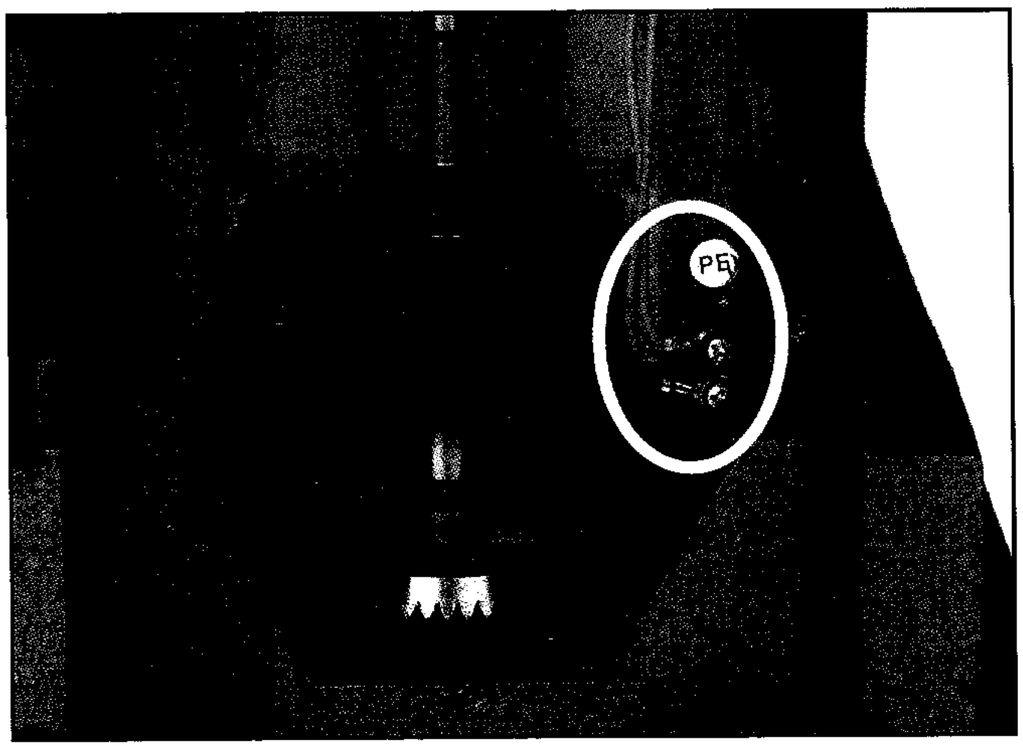


Figure 31. Equipment grounds.

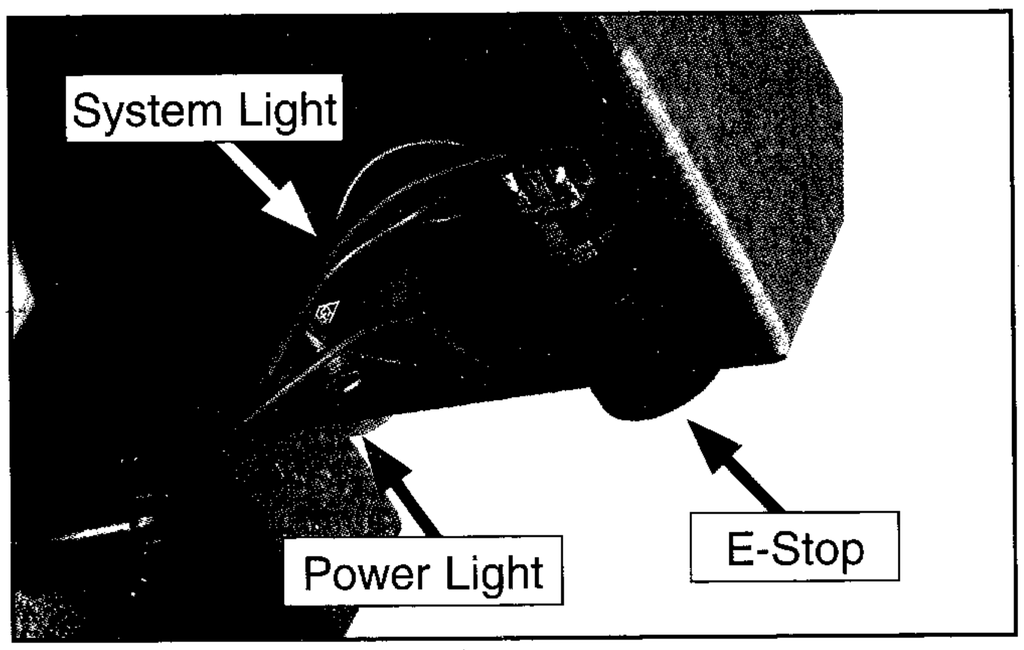


Figure 32. E-Stop and indicator lights.

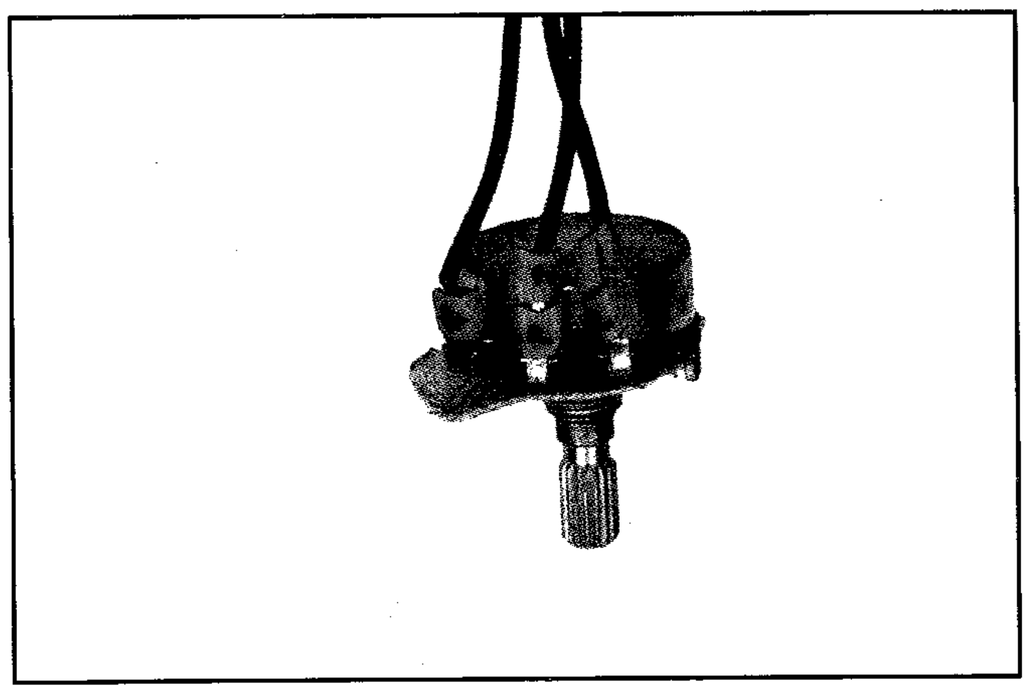


Figure 33. RPM control.

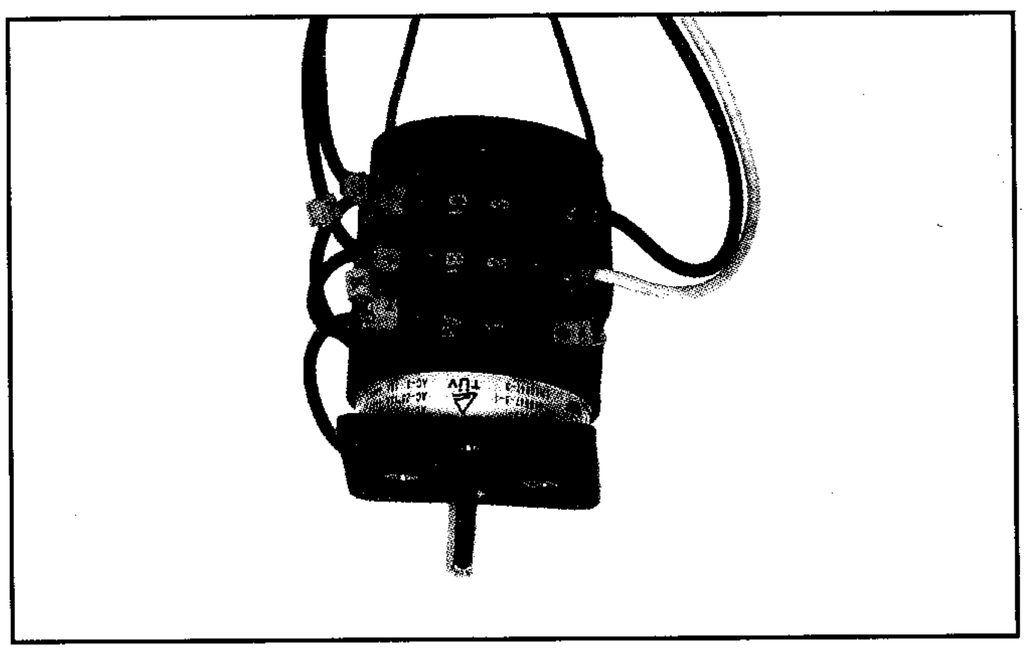


Figure 34. Forward/Reverse switch.

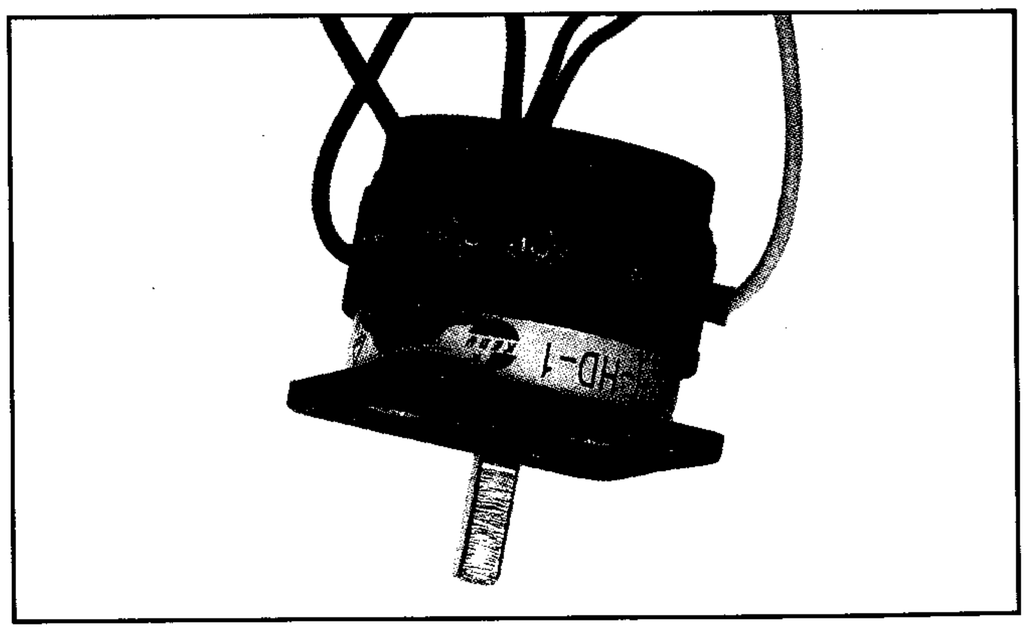
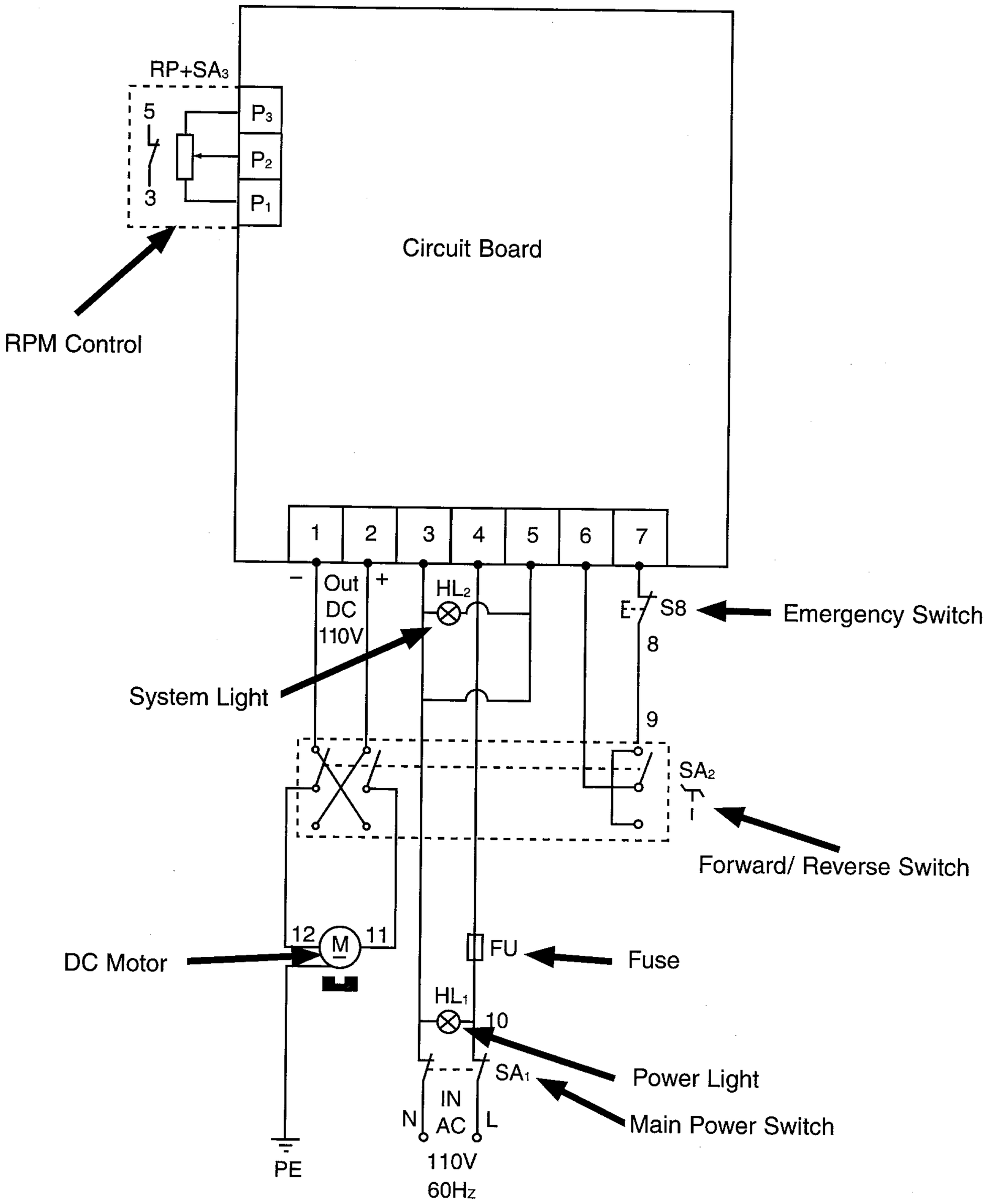
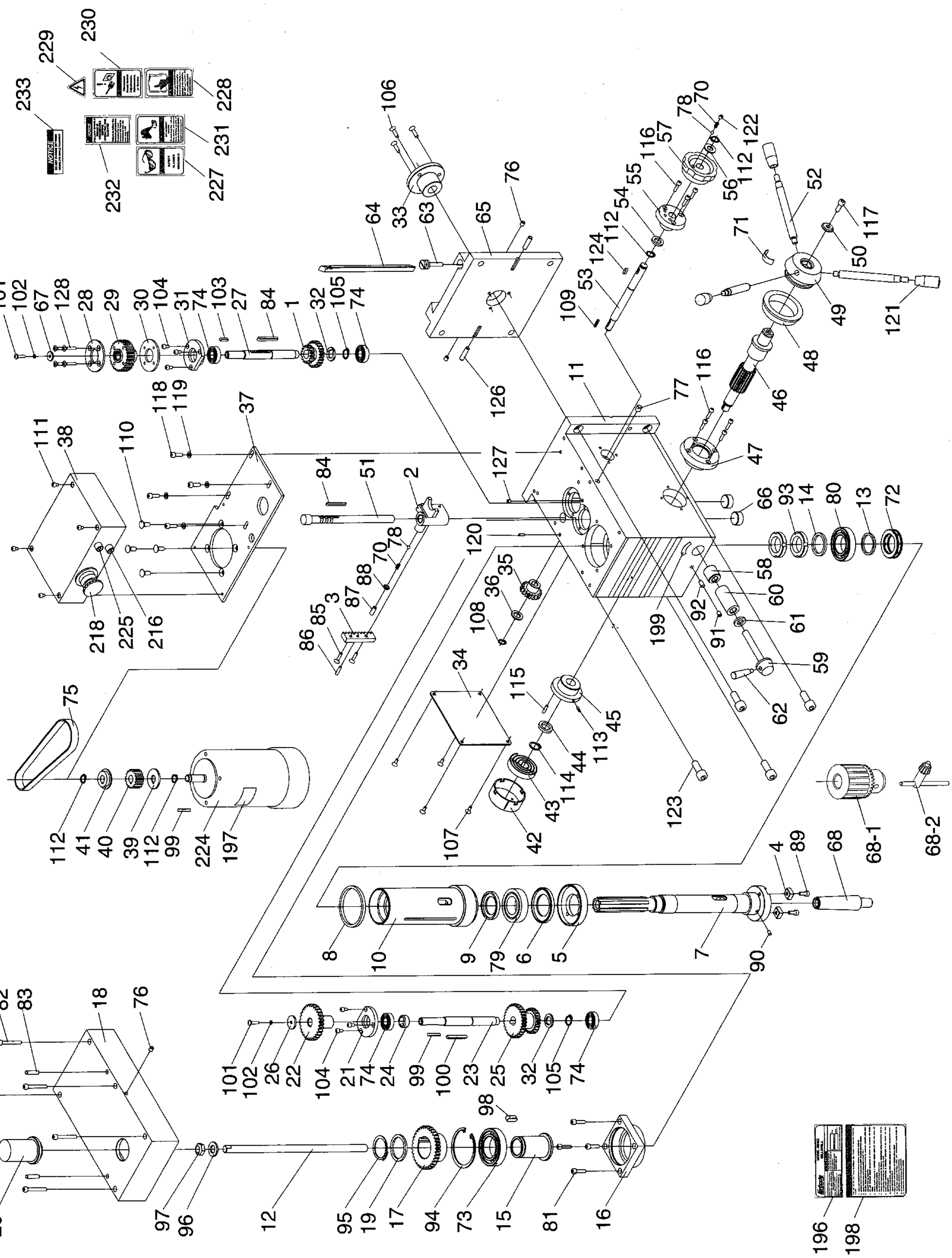


Figure 35. Main power switch.

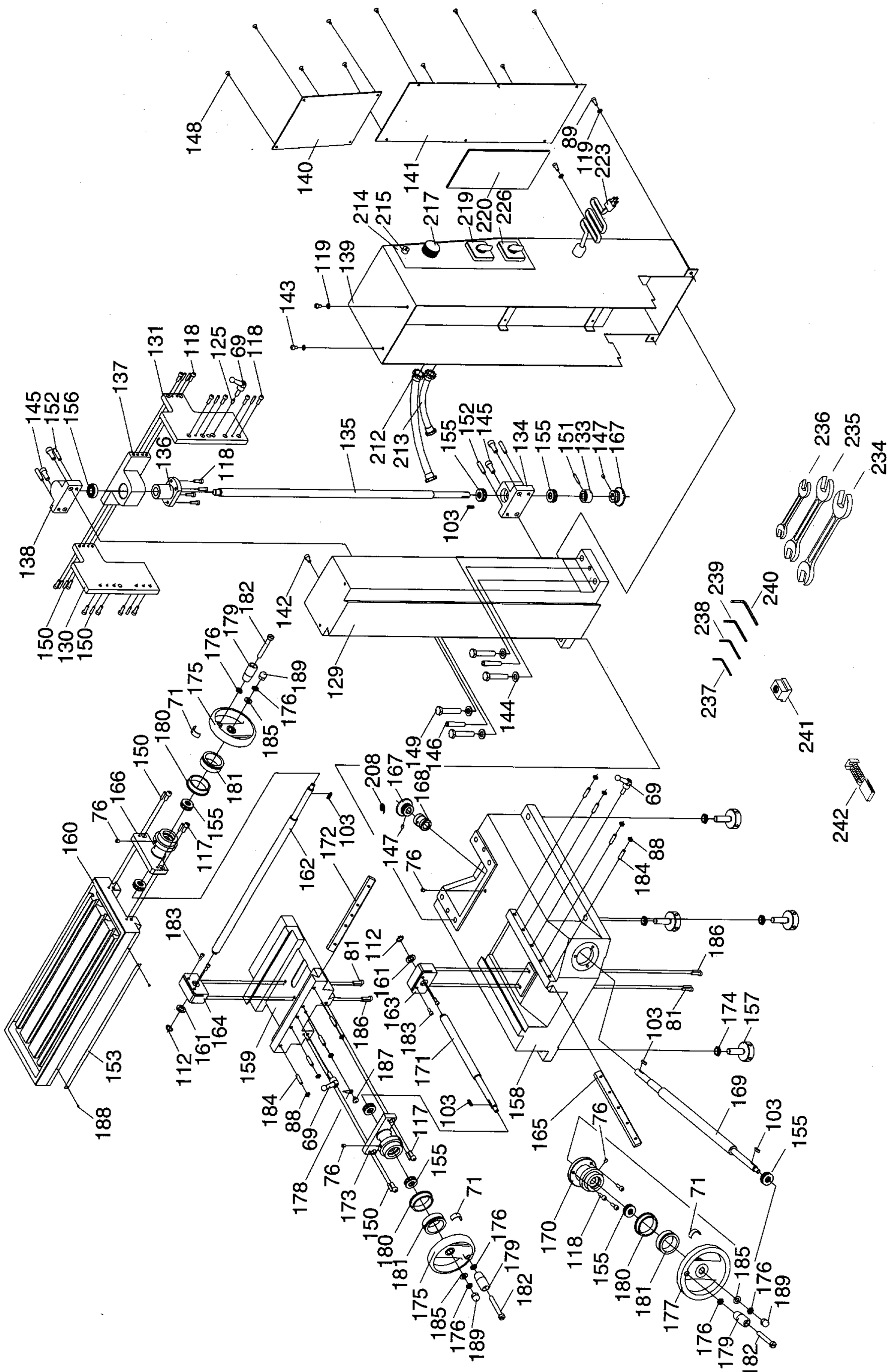
Wiring Diagram



Parts Breakdown



Parts Breakdown



Parts List

REF	PART #	DESCRIPTION
1	P0463001	TRANSMISSION GEAR
2	P0463002	DIAL FORK
3	P0463003	SMALL GEAR RACK
4	P0463004	SPECIAL NUT
5	P0463005	DUST CAP
6	P0463006	OIL SEAL
7	P0463007	SPINDLE
8	P0463008	SLEEVE
9	P0463009	OIL SEAL
10	P0463010	QUILL
11	P0463011	HEAD CASTING
12	P0463012	DRAWBAR
13	P0463013	SPACER
14	P0463014	SPACER
15	P0463015	SLEEVE
16	P0463016	BEARING SEAT
17	P0463017	SPINDLE GEAR
18	P0463018	COVER
19	P0463019	SPACER
20	P0463020	DRAWBAR CAP
21	P0463021	BEARING SEAT
22	P0463022	GEAR
23	P0463023	SHAFT
24	P0463024	SLEEVE
25	P0463025	TRANSMISSION GEAR
26	P0463026	FENDER WASHER
27	P0463027	SHAFT
28	P0463028	UPPER FLANGE
29	P0463029	GEAR
30	P0463030	LOWER FLANGE
31	P0463031	BEARING SEAT
32	P0463032	SPACER
33	P0463033	FLANGE
34	P0463034	COVER
35	P0463035	GEAR
36	PW06M	FLAT WASHER 12MM
37	P0463037	MOTOR FIXED TRAY
38	P0463038	CONTROL BOX
39	P0463039	SPACER
40	P0463040	GEAR
41	P0463041	SPACER
42	P0463042	SPRING COVER
43	P0463043	FLAT COIL SPRING
44	P0463044	BUSHING
45	P0463045	LEFT SUPPORT FLANGE
46	P0463046	PINION
47	P0463047	RIGHT SUPPORT FLANGE
48	P0463048	COLLAR
49	P0463049	HANDLE HUB
50	P0463050	CAP

REF	PART #	DESCRIPTION
51	P0463051	DIAL FORK SHAFT
52	P0463052	QUILL HANDLE
53	P0463053	SHAFT
54	P0463054	BUSHING
55	P0463055	RIGHT SUPPORT FLANGE
56	P0463056	BUSHING
57	P0463057	HIGH/LOW KNOB
58	P0463058	SPINDLE LOCK SLEEVE II
59	P0463059	SPINDLE LOCK HANDLE
60	P0463060	SPINDLE LOCK SLEEVE I
61	P0463061	SPACER
62	P0463062	SMALL HANDLE
63	P0463063	GIB ADJUST SCREW
64	P0463064	GIB
65	P0463065	COLUMN PLATE
66	P0463066	END CAP
67	P0463067	CAP
68	P0463068	ARBOR R8/JT6
68-1	P0463068-1	CHUCK 3-16MM/JT6
68-2	P0463068-2	CHUCK KEY
69	P0463069	SMALL HANDLE
70	P0463070	COMPRESSION SPRING
71	P0463071	FLAT SPRING
72	P0463072	BEARING 8106
73	P6007	BEARING 6007
74	P6001	BEARING 6001
75	P0463075	TIMING BELT
76	P0463076	OIL FITTING
77	P0463077	OIL FITTING
78	P0463078	STEEL BALL
79	P0463079	BEARING Z007106
80	P6006	BEARING 6006
81	PSB15M	CAP SCREW M5-.8 X 20
82	PSB78M	CAP SCREW M5-.8 X 40
83	P0463083	SOLID PIN 6 X 25
84	PK68M	KEY 4 X 4 X 40
85	PS56M	PHLP HD SCR M4-.7 X 16
86	PRP76M	ROLL PIN 4 X 16
87	PSS11M	SET SCREW M6-1 X 16
88	PN01M	HEX NUT M6-1
89	PSB33M	CAP SCREW M5-.8 X 12
90	PRP74M	ROLL PIN 4 X 8
91	PSS53M	SET SCREW M5-.8 X 12
92	PSS04M	SET SCREW M6-1 X 12
93	P0463093	LOCK RING M27 -1.5
94	PR38M	INT RETAINING RING 62MM
95	PR12M	EXT RETAINING RING 35MM
96	PW06M	FLAT WASHER 12MM
97	PN09M	HEX NUT M12-1.75
98	PK107M	KEY 8 X 8 X 20

Parts List

REF	PART #	DESCRIPTION
99	PK30M	KEY 4 X 4 X 25
100	PK34M	KEY 5 X 5 X 20
101	PSB16M	CAP SCREW M4-.7 X 16
102	PLW02M	LOCK WASHER 4MM
103	PK37M	KEY 4 X 4 X 16
104	PSB18M	CAP SCREW M4-.7 X 8
105	PR06M	EXT RETAINING RING 16MM
106	PS40M	PHLP HD SCR M5-.8 X 16
107	PS07M	PHLP HD SCR M4-.7 X 8
108	PR01M	EXT RETAINING RING 10MM
109	PK98M	KEY 3 X 3 X 16
110	PS11M	PHLP HD SCR M6-1 X 16
111	PSB110M	CAP SCREW M4-.7 X 6
112	PR06M	EXT RETAINING RING 16MM
113	PRP44M	ROLL PIN 3 X 10
114	PR06M	EXT RETAINING RING 16MM
115	PRP76M	ROLL PIN 4 X 16
116	PSB16M	CAP SCREW M4-.7 X 16
117	PSB01M	CAP SCREW M6-1 X 16
118	PSB24M	CAP SCREW M5-.8 X 16
119	PW02M	FLAT WASHER 5MM
120	PRP84M	ROLL PIN 4 X 10
121	P0463121	LONG HANDLE SLEEVE
122	PSS02M	SET SCREW M6-1 X 6
123	PSB64M	CAP SCREW M10-1.5 X 25
124	PK69M	KEY 4 X 4 X 12
125	PRP35M	ROLL PIN 5 X 10
126	PRP85M	ROLL PIN 6 X 26
127	PSS26M	SET SCREW M5-.8 X 6
128	PS52M	PHLP HD SCR M4-.7 X 20
129	P0463129	COLUMN
130	P0463130	LEFT SIDE PLATE
131	P0463131	RIGHT SIDE PLATE
133	P0463133	LIMIT SLEEVE
134	P0463134	LOWER BEARING SEAT
135	P0463135	VERTICAL LEAD SCREW
136	P0463136	VERTICAL LEAD NUT
137	P0463137	SUPPORT
138	P0463138	UPPER BEARING SEAT
139	P0463139	REAR CABINET
140	P0463140	SMALL COVER
141	P0463141	LARGE COVER
142	PSB04M	CAP SCREW M6-1 X 10
143	PSB03M	CAP SCREW M5-.8 X 8
144	PW04M	FLAT WASHER 10MM
145	PSB14M	CAP SCREW M8-1.25 X 20
146	PRP86M	ROLL PIN 8 X 45
147	PSS31M	SET SCREW M5-.8 X 8
148	PS17M	PHLP HD SCR M4-.7 X 6
149	PB73M	HEX BOLT M10-1.5 X 50

REF	PART #	DESCRIPTION
150	PRP39M	ROLL PIN 4 X 20
151	PRP56M	ROLL PIN 4 X 25
152	PRP73M	ROLL PIN 4 X 30
153	P0463153	RULER
155	P0463155	BEARING 8101
156	P6001	BEARING 6001
157	P0463157	ADJUSTABLE FOOT
158	P0463158	BASE
159	P0463159	SADDLE
160	P0463160	WORKTABLE
161	P0463161	SPACER
162	P0463162	Y-AXIS FEED SCREW
163	P0463163	X-AXIS FEED SCREW NUT
164	P0463164	Y-AXIS FEED SCREW NUT
165	P0463165	X-AXIS GIB
166	P0463166	Y-AXIS BEARING SEAT
167	P0463167	GEAR
168	P0463168	SLEEVE
169	P0463169	Z-AXIS SHAFT
170	P0463170	SUPPORT FLANGE
171	P0463171	X-AXIS FEED SCREW
172	P0463172	Y-AXIS GIB
173	P0463173	X-AXIS BEARING SEAT
174	PN09M	HEX NUT M12-1.75
175	P0463175	HANDWHEEL
176	PN03M	HEX NUT M8-1.25
177	P0463177	HANDWHEEL
178	P0463178	POINTER
179	P0463179	HANDLE SLEEVE
180	P0463180	INLAY RING
181	P0463181	GRADUATED DIAL
182	P0463182	SHOULDER SCREW M8-1.25 X 55
183	PSB23M	CAP SCREW M4-.7 X 12
184	PSS12M	SET SCREW M6-1 X 25
185	PW01M	FLAT WASHER 8MM
186	PRP42M	ROLL PIN 3 X 20
187	PS37M	PHLP HD SCR M6-1 X 6
188	P0463188	RIVET
189	P0463189	CAP NUT
196	P0463196	MACHINE ID LABEL I
197	P0463197	MOTOR LABEL
198	P0463198	MACHINE ID LABEL II
199	P0463199	LOCK LABEL
208	P0463208	FINE LEAD WIRE 1 X 85
212	P0463212	STRAIN RELIEF
213	P0463213	FLEX CONDUIT
214	P0463214	SWITCH LABEL
215	P0463215	FUSE BOX
216	P0463216	POWER INDICATING LAMP
217	P0463217	RPM CONTROLER

Parts List

REF	PART #	DESCRIPTION
218	P0463218	EMERGENCY STOP SWITCH
219	P0463219	REV/OFF/FWD SWITCH
220	P0463220	PC BOARD
223	P0463223	POWER CORD
224	P0463224	MOTOR
225	P0463225	FAULT INDICATING LAMP
226	P0463226	POWER SWITCH
227	PLABEL-11	SAFETY GLASSES LABEL
228	PLABEL-12	READ MANUAL LABEL
229	PLABEL-14	ELECTRICITY LABEL
230	PLABEL-26	UNPLUG 110V LABEL
231	PLABEL-41	ENTAGLEMENT LABEL

REF	PART #	DESCRIPTION
232	P0463232	SPINDLE BREAK-IN LABEL
233	P0463233	CHANGE GEARS LABEL
234	PWR1719	WRENCH 17 X 19
235	PWR1417	WRENCH 14 X 17
236	PWR810	WRENCH 8 X 10
237	PAW03M	HEX WRENCH 3MM
238	PAW04M	HEX WRENCH 4MM
239	PAW05M	HEX WRENCH 5MM
240	PAW06M	HEX WRENCH 6MM
241	P1075001	T-NUT 3/8"
242	P0463224	MOTOR BRUSH

⚠WARNING

Safety labels warn about machine hazards and ways to prevent injury. The owner of this machine MUST maintain the original location and readability of the labels on the machine. If any label is removed or becomes unreadable, REPLACE that label before using the machine again. Contact Grizzly at (800) 523-4777 or www.grizzly.com to order new labels.

WARRANTY AND RETURNS

Grizzly Industrial, Inc. warrants every product it sells for a period of **1 year** to the original purchaser from the date of purchase. This warranty does not apply to defects due directly or indirectly to misuse, abuse, negligence, accidents, repairs or alterations or lack of maintenance. This is Grizzly's sole written warranty and any and all warranties that may be implied by law, including any merchantability or fitness, for any particular purpose, are hereby limited to the duration of this written warranty. We do not warrant or represent that the merchandise complies with the provisions of any law or acts unless the manufacturer so warrants. In no event shall Grizzly's liability under this warranty exceed the purchase price paid for the product and any legal actions brought against Grizzly shall be tried in the State of Washington, County of Whatcom.

We shall in no event be liable for death, injuries to persons or property or for incidental, contingent, special, or consequential damages arising from the use of our products.

To take advantage of this warranty, contact us by mail or phone and give us all the details. We will then issue you a "Return Number," which must be clearly posted on the outside as well as the inside of the carton. We will not accept any item back without this number. Proof of purchase must accompany the merchandise.

The manufacturers reserve the right to change specifications at any time because they constantly strive to achieve better quality equipment. We make every effort to ensure that our products meet high quality and durability standards and we hope you never need to use this warranty.

Please feel free to write or call us if you have any questions about the machine or the manual.

Thank you again for your business and continued support. We hope to serve you again soon.

Grizzly Industrial, Inc. WARRANTY CARD

Name _____

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City _____ State _____ Zip _____

Phone # _____ Email _____ Invoice # _____

Model # _____ Order # _____ Serial # _____

The following information is given on a voluntary basis. It will be used for marketing purposes to help us develop better products and services. ***Of course, all information is strictly confidential.***

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____ Advertisement	____ Friend	____ Catalog
____ Card Deck	____ Website	____ Other:

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____ Cabinet Maker	____ Popular Mechanics	____ Today's Homeowner
____ Family Handyman	____ Popular Science	____ Wood
____ Hand Loader	____ Popular Woodworking	____ Wooden Boat
____ Handy	____ Practical Homeowner	____ Woodshop News
____ Home Shop Machinist	____ Precision Shooter	____ Woodsmith
____ Journal of Light Cont.	____ Projects in Metal	____ Woodwork
____ Live Steam	____ RC Modeler	____ Woodworker West
____ Model Airplane News	____ Rifle	____ Woodworker's Journal
____ Modeltec	____ Shop Notes	____ Other:
____ Old House Journal	____ Shotgun News	

3. What is your annual household income?

____ $20,000-$29,000	____ $30,000-$39,000	____ $40,000-$49,000
____ $50,000-$59,000	____ $60,000-$69,000	____ $70,000+

4. What is your age group?

____ 20-29	____ 30-39	____ 40-49
____ 50-59	____ 60-69	____ 70+

5. How long have you been a woodworker/metalworker?

____ 0-2 Years ____ 2-8 Years ____ 8-20 Years ____ 20+ Years

6. How many of your machines or tools are Grizzly?

____ 0-2 ____ 3-5 ____ 6-9 ____ 10+

7. Do you think your machine represents a good value? ____ Yes ____ No

8. Would you recommend Grizzly Industrial to a friend? ____ Yes ____ No

9. Would you allow us to use your name as a reference for Grizzly customers in your area?
Note: *We never use names more than 3 times.* ____ Yes ____ No

10. Comments: _____

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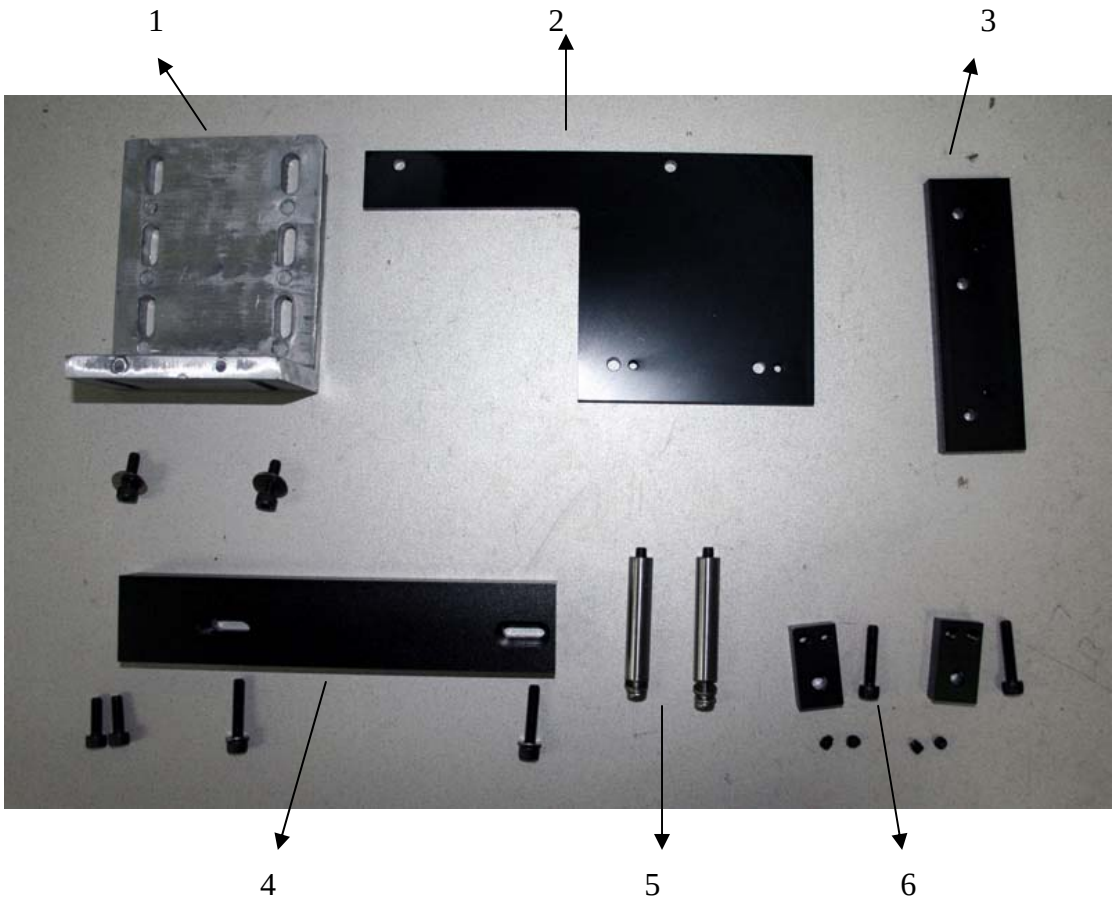
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Installation Instruction Seig X3 Super DRO kits



Parts Description

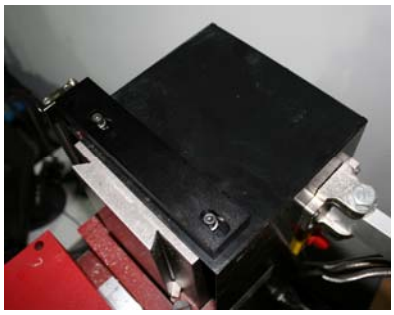


1. The L bracket for you to install the Z Axis DRO sensor
2. The Connect plate for the Y axis
3. The Z axis adapter plate, you can direct unscrew the X3 super and attached this plate and secure it, then you can attached the No.1 Parts, it will allow the parts move slighty in one plane all direction, which allow you to connect and align the DRO to parallel to the Z axis.
4. This parts secure on top of the X3 machine, unscrew the 2 hex nut that secure the back cover, and install this parts with the screw at the original thread hole, This will also allow you move the part slight in position so you can adjust the DRO parallel to the DRO.
5. This is the Extended shaft, you need to measure and drill 2 hole on the Y axis and tape it with the M4, then screw in this 2 parts and install the No.2 parts. The No2 parts then mount with the Y axis DRO sensor.

6. This 2 set of the mount support is for you to mount the Y Axis, it allow you the adjust the set screw before you secure the Y hex screw, so it parallel with the NO.5 plate, and allow the DRO sensor run parallel with the Scale.

7. You will need to drill and tap few holes in order to intall this DRO kits, it won't be hard to do but take some time and careful skill to make this nice installation, most of the difficult is done by the custom parts and design of this kits. One has typical metal drill/tap skill will complete this installation in few hour with professional result.

Please take a good look of below picture for the installation location.



Top Z plate mount



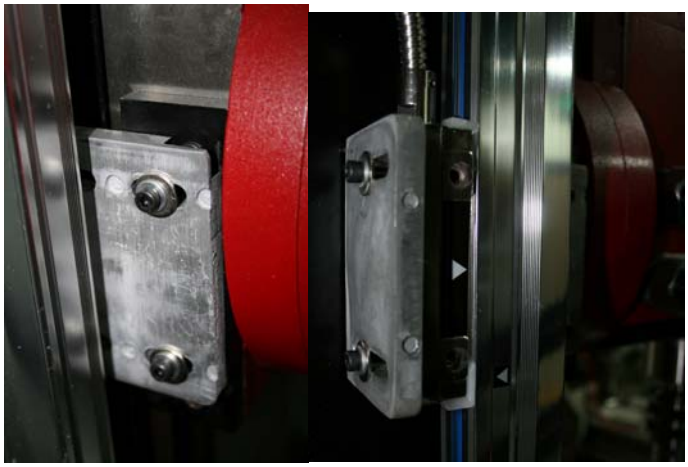
recommend DRO location



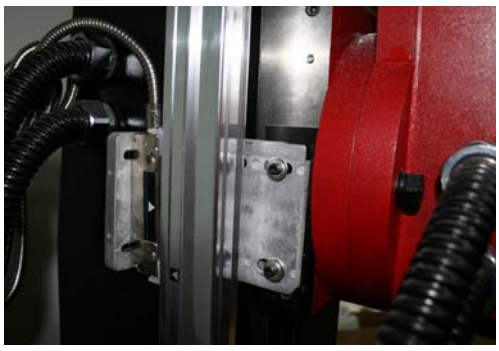
You will need to 2 x drill and tap M5 hole so you can mount the X axis DRO on the mill table.
And another 2 x drill and tap M5 hole so you can mount the sensor on below deck, the thin metal and screws included in the DRO package will allow you to align the sensor so it can parallel with the DRO unit.



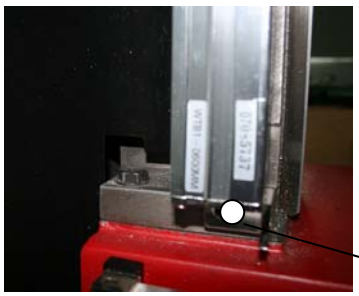
This is the view of the Y axis installation,to install the round extended shaft, you will need to drill 2 M4 tap hole, so you can screw in the extender, then install the special L shape plate (the plate will have screw hole that allow you to secure to the y Axis DRO sensor). The small pillow block with set screw will allow you to fine adjust the DRO parallel with the Y axis. Then you will need to drill 2x drill and tap M5 hole on the base, so you can secure the y Axis DRO.



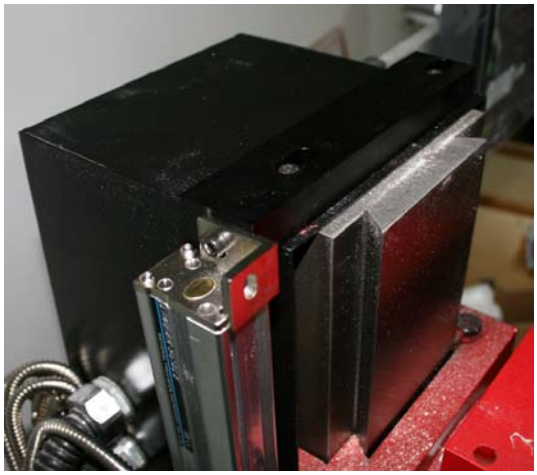
The small black aluminum plate allow you to install to the Z axis mill head just by unscrew the machine screw, so the large L aluminum bracket can mount on top



The complete view of the Z axis, secure the Senor to the large L bracket.



Drill and tap a M5 hole here so you can secure the Z DRO.



The top Z plate allow you to adjust the Z DRO parallel to the Z axis.

Please make sure when you install the DRO, you need to make sure when the sensor move from end to end, it shouldn't had any hard pressure press to the DRO due to the misalignment (such as if the DRO mount with large angle error when you move the secure sensor, it will press and wear the DRO rail or error reading), all movement must be smooth and parallel to the axis movement.

There is 3 cover that customer can optional install to cover the machine, its relative simple that just need to use 2 screw to secure it on the machine.

WE6800 Seris DRO

USER'S GUIDE

VER5.01

WE6800M-2	DRO for 2 axes
WE6800M-3	DRO for 3 axes
WE6800E	DRO for EDM

Rational Precision Instrument Co.,Ltd

Safety Precaution



Warning



- Do not use the display unit with voltages other than the idicated power voltage(AC 90-250V, 50-60HZ), and do not connect multiple plugs to a single outler as this may result in fire or electric shock.
- Do not damage, modify, excessively bend, pull on, place heavy objects on or heat the power cord, as this may damage the power cord an d result in fire or electric shock.



- Do not handle the power plug with wet hands as this may result in electric shock.
- Do not open the cover of the display unit to disassemble or modify the unit or to replace the fuses, as.this may result in burns.or injry. These actions may also damage the internal circuitry.



Caution

- When unplugging the power plug, do not pull on the power cord as this may damage the cord and result in fire or electrical shock. Be sure to grip the power plug when unpluggig it from the socket.



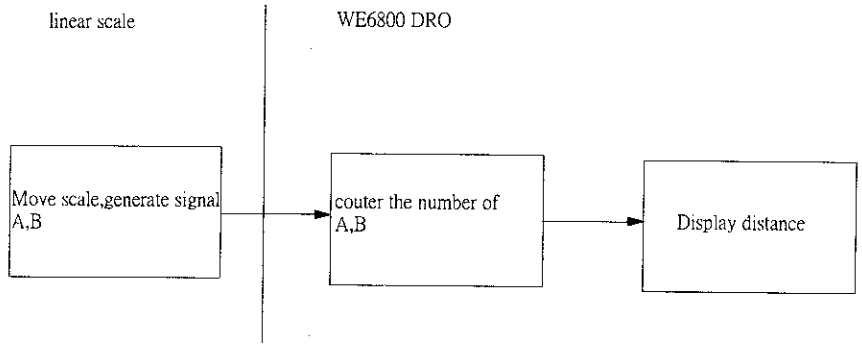
- The unit does not have an explosion-proof structure. Therefore, do not use the unit in an atmosphere charged with inflammable gases as this may result in fire.
- When the unit will not be used for an extended period of time, be sure to unplug the power plug from the socker for safety.



- Be sure to turn off the power before connecting or disconnecting power and signal connectos in order to prevent damage or misoperation.
- The unit does not have an earthquake-proof structure. Therefore, do not use the unit in moving areas or areas exposed to strong shocks.

Principle

WE6800 series DRO provides displaying disptance and positon for machine tool,grinding machine, milling machine and EDM. It's principle is as follow:

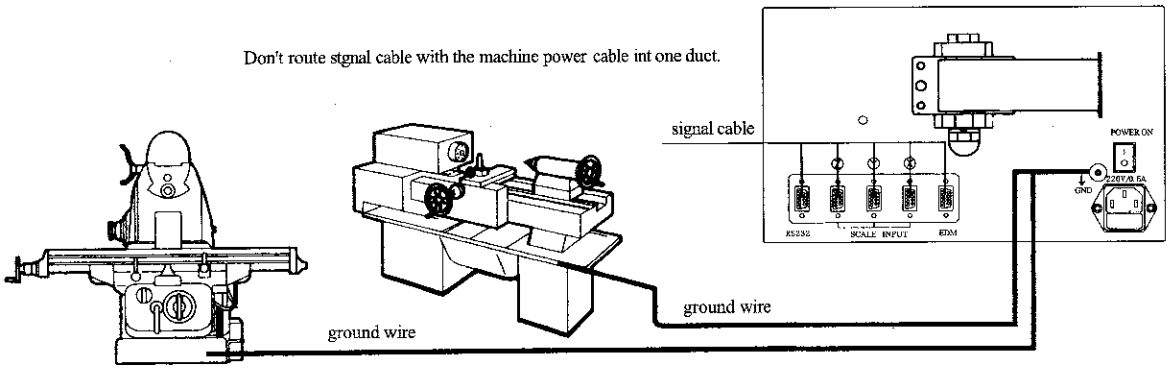


WE6800 Serial DRO Specifications

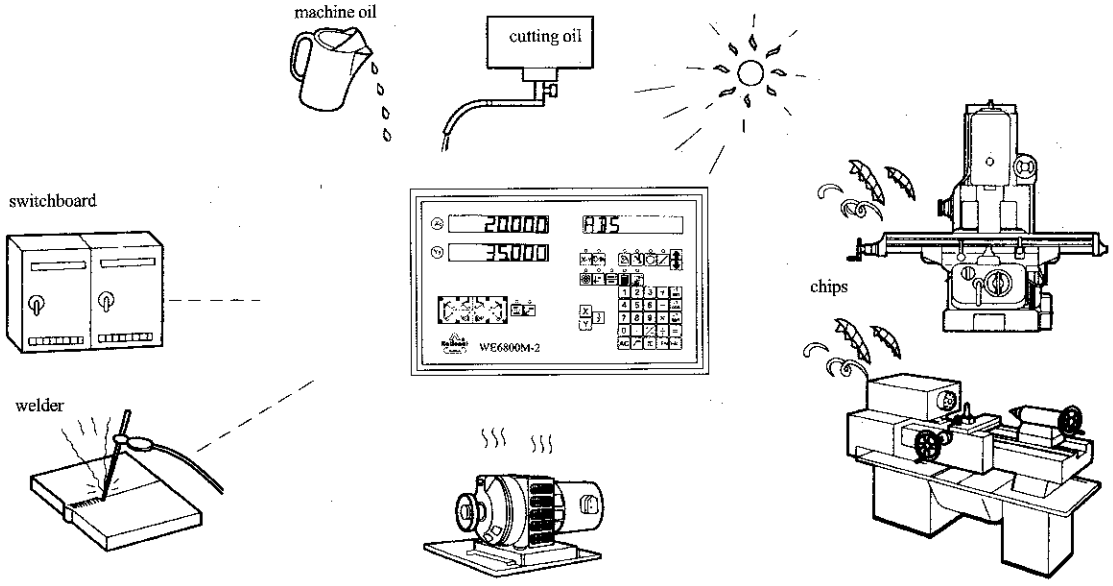
Input power voltage	85 V - 265V
Power consumption	MAX.15W
Operating temperature	0° - 40° (32--104° F)
Storing temperature	0° - 40° (-4--104° F)
Relative humidity	< 90%
Weight	1.45Kg
Dimenstion	295 X 185 X 45 (Unit: mm)
No.of axes displayed	2（WE6800M-2）, 3 (WE6800M-3,WE6800E)
Interface of linear scale	9PD/7PD/15PD
Scale Signal	TTL, drive capacity > 10 mA
Resolution of scale	0.05 μm,0.1 μm,0.2 μm,0.5 μm,1 μm,2 μm,5 μm,10 μm,20 μm,50 μm
Pitch of linear scale	0.02mm
Precision of scale	High grade ±（3+3L / 1000）, standard grade ±（5+5L / 1000）
WE6800E	
EDM interface	Output a on/off signal , drive capacity >100mA
Options	
RS232 interface	A pin for TX signal, a pin for TX signal
Edge detection	High voltage 5V,drive capacity > 10mA

Handing Instruction

- Do not route the head connecting cable, power cord, etc, together with the mechine power line in one duct.
- Supply power from an AC lamp source（AC 90 – 250 V, 50 – 60HZ）
- Connect the ground terminal to the machine with the supplied ground wire. Make sure the machie is grounded.



- Place the display unit more than 0.5m(20") away fron a high voltage source, large current source, large power relay, etc.
- For installation of the display unit, avoid a location exposed to chips, cutting oil, or machine oil. Lf unavoidable, take abepuate countermeasutes.
- Do not put a vinyl cover directly over the display unit or put it in a closed container.
- The ambient temperature should be in the range of 0℃ to 40℃(32 to 104℉). Avoid exposure to direcr sunlight, hot air currents,or heated air.



- If the power supply voltage is lower than specified, the display may not be illuminated even with the power switch turned on. Be sure to use the power in the specified range.
- Note that if the power is interrupted momentarily or the voltage drops temporarily below the normal operating range, an alarm may operate or a malfunction may occur.
- Be sure to use the display unit inside.

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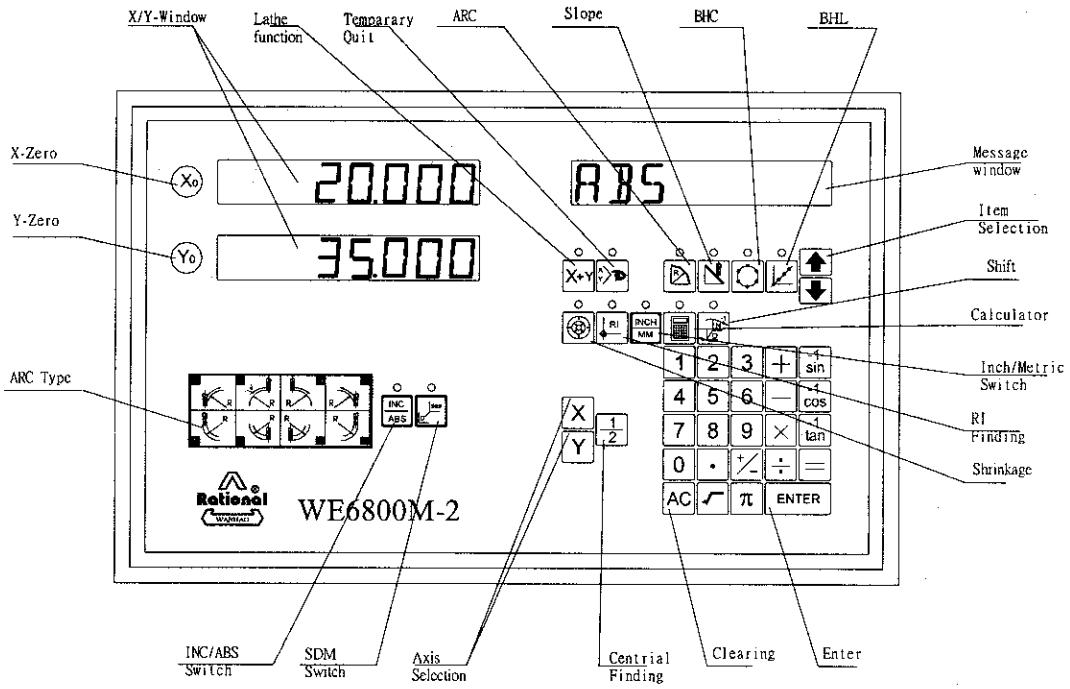
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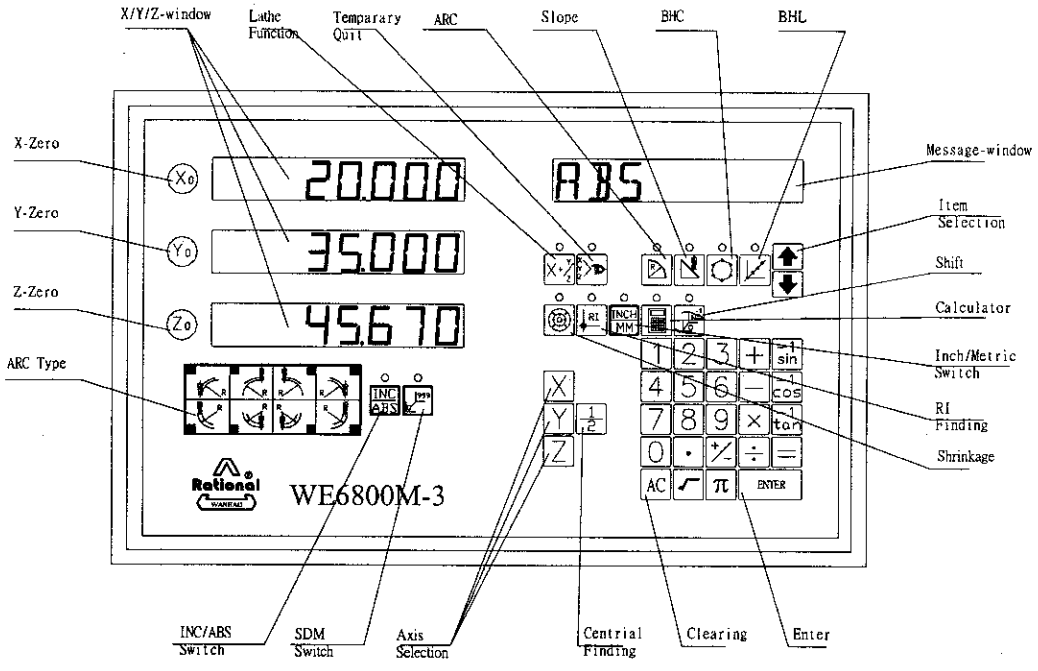
Chapter 1. INSTRUDITION

1.1 Front Panel

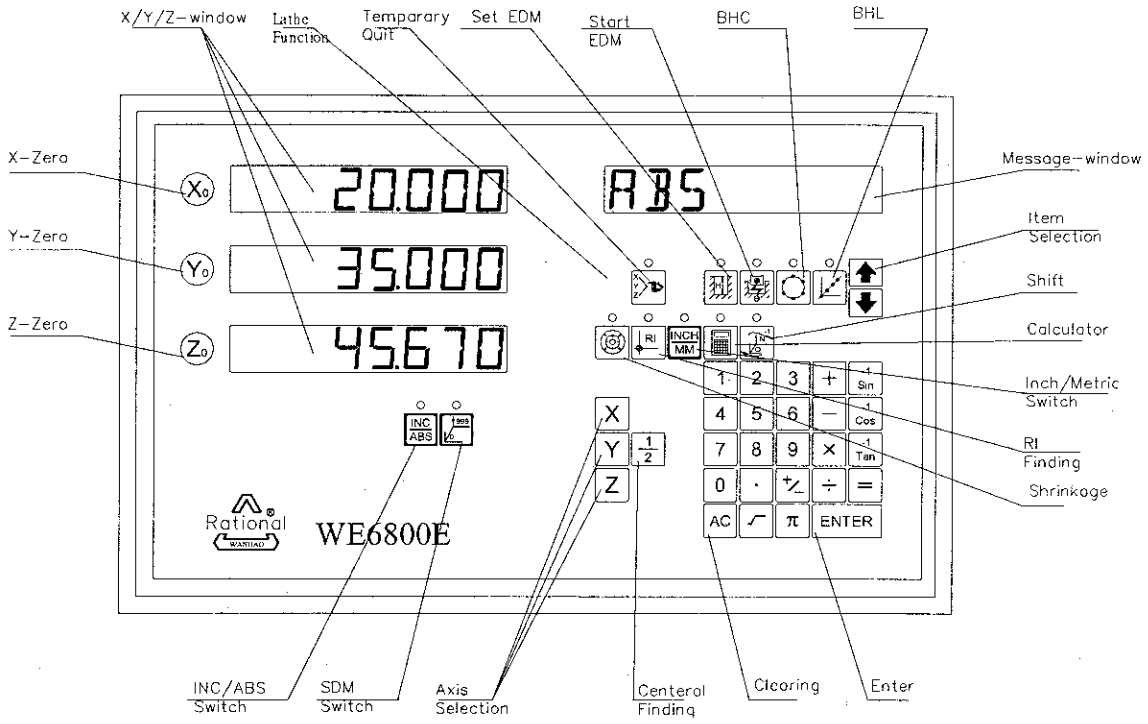
WE6800M-2 DRO for 2 axes



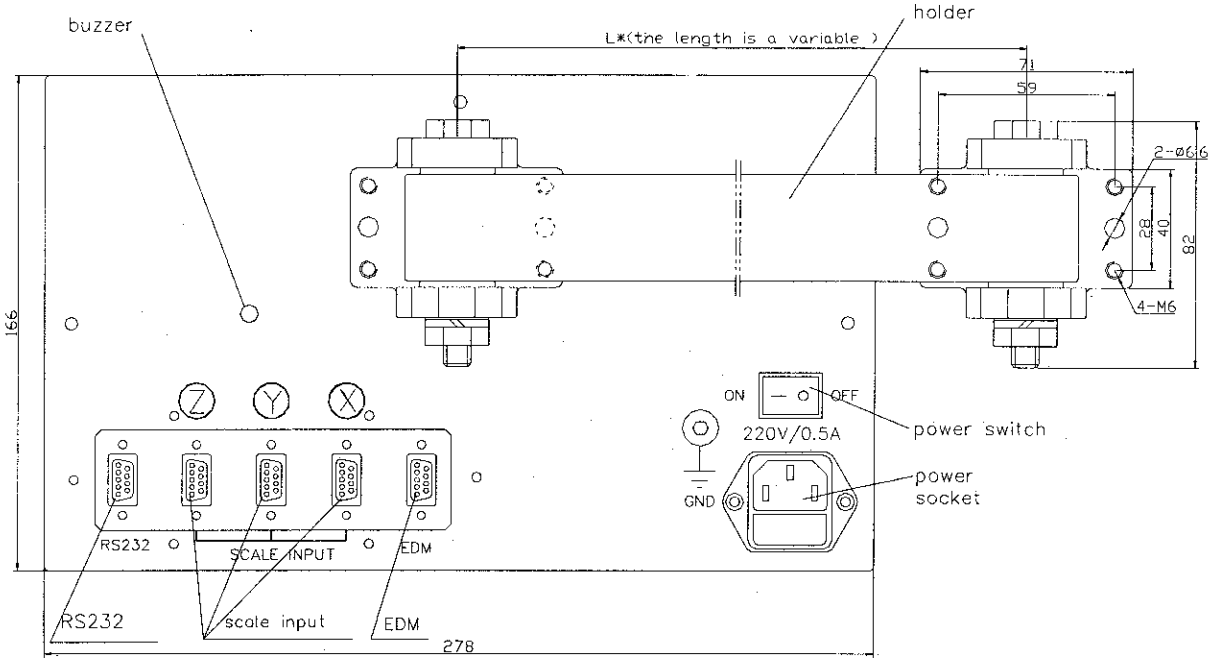
WE6800M-3 DRO for 3 axes



WE6800E DRO for EDM(electrode discharging machining)



1.2 Back Panel



1.3 Description of Key Function

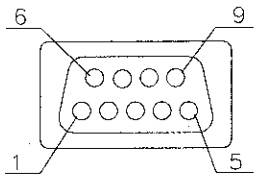
	KEY MARK	KEY NAME	FUNCTION	WE6800 M-2	WE6800 M-3	WE6800 E
1	X0 Y0 Z0	X/Y/Z-Zero	Zero selected axis.	No Z0		
2	X Y Z	Axis Selection	Select axis to operate.	No Z		
3	INCH MM	Inch/Metric Switch	Toggle display unit between metric and inch.			
4	1/2	Centrial Finding	Havle a display value of a axis.			
5	INC ABS	ABS/IINC Switch	Toggle between ABS/INC coordinate.			
6	RI	RI Finding	Find the origin of the linear scale.			
7		Shrinkage	Toggle between shrinkage and unshrinkage.			
8		SDM Switch	Second data memory.			
9	0 ... 9	Numeric Key	Enter number .			
10	.	Decimal Point	Enter decimal point.			
11	+/-	+/- Sign	Enter +/- sign.			
12	ENTER	Enter	Confirm operation.			
13	AC	Clearing	Cancle incorrect operation.			
14		Temparary Quit	1 Leave processing temporarily to return normal display state. 2 Enter auto edge detection.		X	X
15		Temparary Quit	1 Leave processing temporarily to return normal display state. 2 Enter auto edge detection.	X		
16		Calculator	Enter /quit calculating state.			
17		Shift	1 Calculate inverse trigonometric unction in calculating function. 2 Enter No.of SDM xoordimate .			
18	sin cos tan	Trigonometric Function	Calculate trigonometric or inverse trigonometric.			
19	+ - ÷ ×	Add, Decrease, Multiple, Divide	Operate adding, decreasing, multiplying,dividing.			
20		Radical Sign	Square root or square.			
21	π	Circumference Ratio	Enter circumference ratio.			
22	=	Equality Sign	Make calculating result.			
23		Set EDM	Set parameters of EDM.	X	X	
24		Start EDM	Enter EDM processing.	X	X	
25		BHC	Process holes displayed equally on a circle.			
26		BHL	Process holes displayed equally on a line.			
27		ARC	Simple R cutting function			X
28		SLOPE	Procees a slope.			X
29	X+Y	Lathe Function	Enter or exit lathe function.		X	X
30	X+Y/2	Lathe Function	Enter or exit lathe function.	X		X
31		Item Selection	Stroll up or down to select .			

Note: "X"indicates this model has no such a function.

1.4 Interface

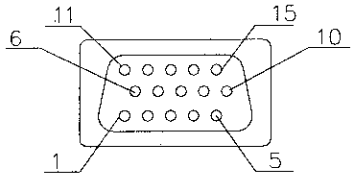
A Linear scale interface

1) 9PD Connector



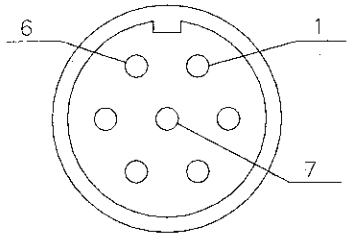
PIN	NAME	COLOR
1	+5V	RED
2	0V	BLK
3	A	BRW
4	B	YEL
5	RI	ORG

2) 15PD Connector



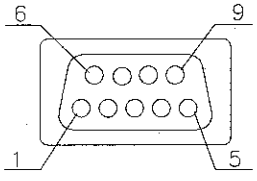
PIN	NAME	COLOR
1	+5V	RED
2	0V	BLK
3	A	BRW
4	B	YEL
5	RI	ORG

3) 7Pin Connector



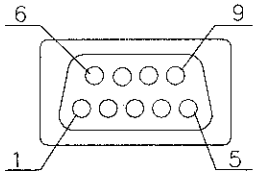
PIN	NAME	COLOR
1	OV	BLK
2	NC	
3	A	
4	B	YEL
5	+5V	RED
6	RI	ORG
7	FG	SHILD WIRE

B RS232 Interface



PIN	NAME	COLOR
1	NC	
2	TXD	YEL
3	RXD	ORG
4	NC	
5	GND	BRW

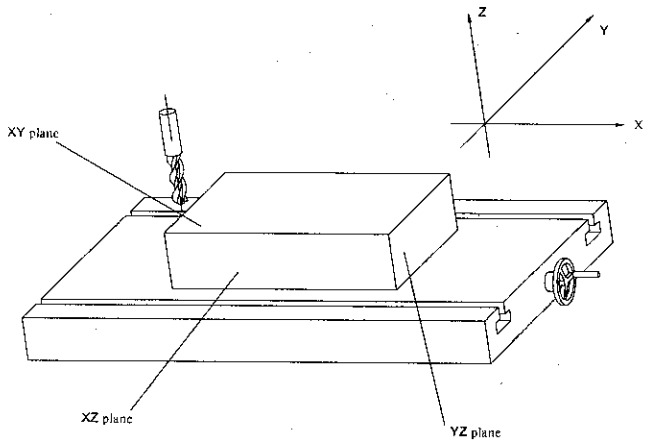
C EDM Interface



PIN	NAME	COLOR
1	NC	
2	COMMON	ORG
3	NORMAL CLOSE	BRW
4	NC	
5	IN+	RED
6	NORMAL OPEN	YEL
9	IN-	BLK

1.5 Coordinate System

WE6800 DRO is an instrument which can measure, position workpiece when processing. Coordinate system must be definited first for more efficiency and accuracy.



In horizontal plane, the X axis is parallel with the operator,Y axis is perpendicular to X axis.Z-axis is perpendicular to horizontal plane. Positive direction of axis is set as the figure. It also can be changed as custom.

The value of one point position is the distance relative to the origin of coordinate

For a workpiece as Figure A, the value of each point position is as the Figure B when point O is the origin of coordinate.

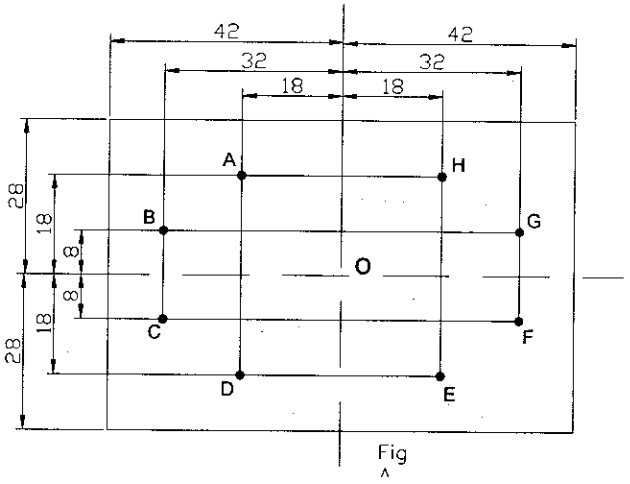


Fig A

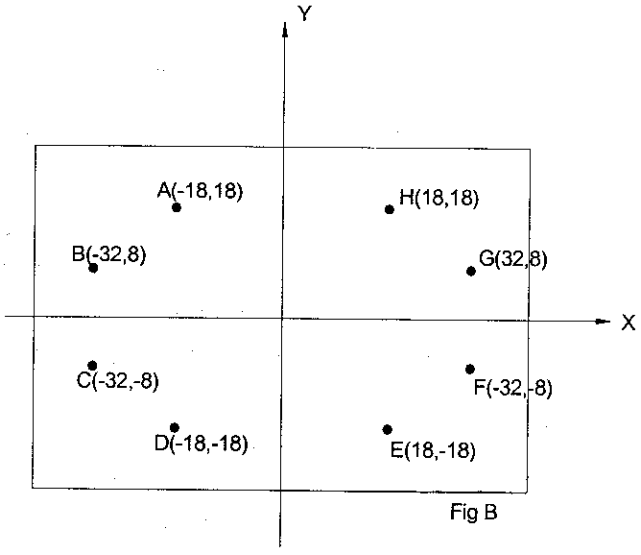


Fig B

Chapter 2. BASIC OPERATION

2.1 Power on

Function: Set the power switch on and WE6800 enter normal display state.

It can memorize the following parameter after power on:

A: The scale position where power off;

B: ABS/INC/SDM mode;

C: Shrinkage is enabled or disable;

D: Metric/Imperial mode;

The origin of the linear scale must be searched again if the scale is moved when power off.

Note:

Normal display state The state DRO automatically enter after on or exit from "STEUP".In normal display state,X window,Y window,Z window displays the current value of X axis,Y axis or Z-axis separately.The message-window displays "ABS","INC" or "SDM XXX"(indicate the Number of SDM coordinate. with range of 000—999).When user switch among ABS/INC/SDM,MM/INCH, or shink-age / Un-shrinkage,DRO will not leave this state. When you enter CALCULATOR function,input data to X(or Y or Z)axis,function of searching the Reference point (RI) of the linear scale or special function (BHC,BHL,ARC,SLOPE PROCESSING and EDM function),DRO is not in the normal display state.



2.2 Zeroing

Function: Zero the designated axis in normal display state.Zeroing is used to set the current point as datum point.

Note: 1 The axes can't be zeroed when DRO is in other states (for example ,in the state of calculating function or in special function). DRO should return normal display state;

2 The axes can be zeroed in ABS/INC/SDM states;

3 When zero in ABS coordinate, INC display value is cleared simultaneously. Zero in INC mode, which has on effect on ABS and SDM display value.

Example 1: Set the point O (as the figure illustrated) as datum

STEPS:

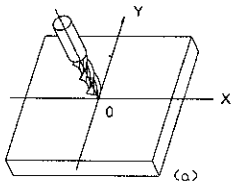
1: Return normal display state;

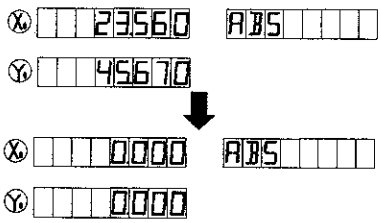
2: Move the machine table ,and align the lathe tool with point O

The DRO displays as the right figure

3: Press X_0 to zero X axis,

Press Y_0 to zero Y axis.





2.3 Presetting Data to Designated Axis

Function: Preset a value to current position for a designated axis in normal display state.

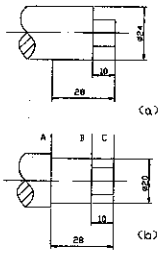
NOTES: 1 When the DRO is in other states(e.g. calculating function or special function), the axis can't be presetted.DRO should return normal display state before presetting data..

2 Axis can be presetted in ABS/INC/SDM state.

3 In SDM state, input mode"0" means that the display value is equal to the enter value; Inpute mode "1" means that the display value is equal to the negative of enter value.

4 The range of input value is that the minimum value to the maximum value which could be displayed in the designated window.

Example: Machine the workpiece from the figure (a) to figure (b), and the plane C is the datum and counting direction is right.

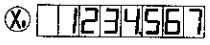


STEPS:

1: Move the machine table,and align the lathe tool to plane B

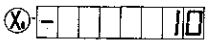
2: Return normal display state;

3: Press [X], "0" is flashing in X window,waiting for entering a data;



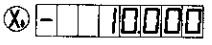
4: Press [1] [0] [+/-] in turn,which means the preset data is "-10";

If incorrect value is inputted ,press [AC] to cancle and input again;

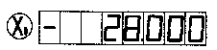


NOTE: In SDM state and SDM input mode is "1", [+/-] needn't be inputted,

otherwise, [+/-] must be inputted.



5: Press [ENTER] to confirm the data that your input and end presetting it to X axis;



6: Moving the machine table until "-28.000" is displayed in X window. Now it is the position of plane A.

7: Y axis ,Z-axis can be presetted in the same way.

2.4 Toggle display unit between mm and inch

Function: Length can be displayed either in "mm"(metric) or "inch"(imperial).Display unit can be toggled between mm and inch.

Example : Display value toggle between mm and inch



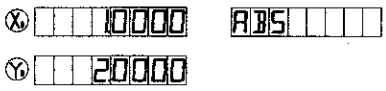
STEPS:



1: DRO return normal display state.The LED of INCH is not on,which means the current unit is mm(metric);



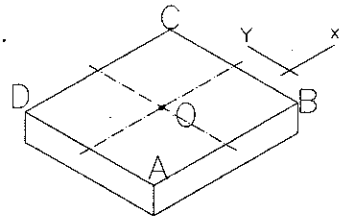
2: Press [INCH/MM] ,then the LED of INCH/mm is on,which means the display unit is inch now.



NOTE: In imperial ,the LED of INCH is on; and in metric unit,the LED of INCH is off.

2.5 Mid-point Calculation

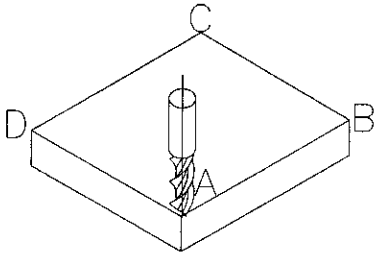
Function: Set the center of workpiece as datum by halving the displayed value.



Example: Set the center of rectangle as datum as the right figure

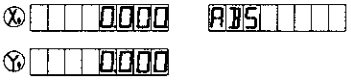
STEPS:

1: Place the workpiece on the machine table,with line AB parallel to X axis,line AD parallel to Y axis;



2: DRO return normal display state, move machine talble ,and alig the lathe tool with point A ;

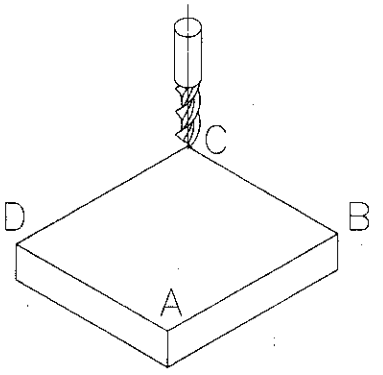
Press X_0 to zero X axis,press Y_0 to zero Y axis;

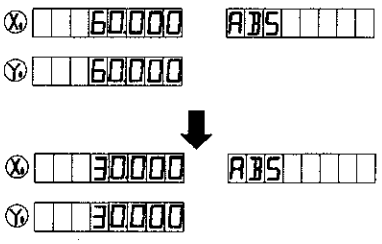


3: Align lathe tool with point C by moving machine table;

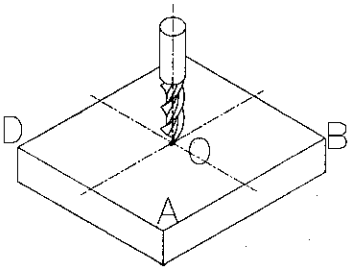
Press [1/2], [X] in turn to halve the X axis display value;

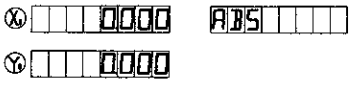
Press [1/2], [Y] in turn to halve the Y axis display value;





4: Move the machine table until "0.000" is displayed in X window ,Y window.The position(where the lathe tool is) is the workpiece's center.

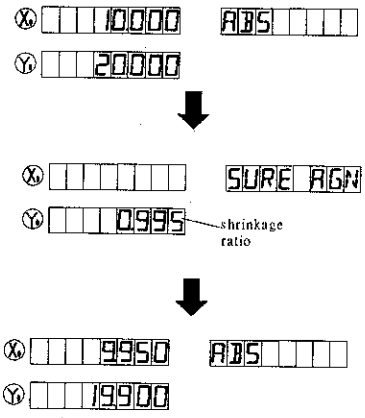




2.6 Setting the Shrinkage Mode

Function: With this function,you can process the mould tools according to the dimension of the finished products without calculating dimension separately .

STEPS:



A: unshrinkage → shrinking

1: DRO return normal display state;

2: Press  and don't release .The Y window displays the current shrinkage ratio,the message-window displays "SURE AGN", which means you need to confirm once again .

3: Press ENTER to enter shrinkage state;press any other key to return former state.

NOTE:  should not be released and press ENTER simultaneously to enter shrinkage state; LED of shrinkage flashes in shrinkage mode;

B: shrinkage → unshrinking .

1: DRO return normal display state;

2: Press  ,now DRO is in unshrinking mode,LED of shrinkage is off;



2.7 Absolute / Incremental / 1000 sets SDM

Function :

The WE6800 series DRO has 3 display modes: the absolute mode (ABS); the incremental mode (INC) and 1000 sets Second Data Memory (SDM) with the range of 000 to 999.

1: Zero point of workpiece is set at the origin point of ABS coordinate;

2: The ralative distance between datum of ABS and SDM remains unchanged when ABS datum is changed.

3: If one point in ABS is zeroed,the point in INC is zeroed automatically;yet if one point in INC is zeroed,the point in ABS will remain unchanged.

1: toggle among ABS/INC/SDM coordinate

These three display modes can be changed only in normal display state.

ABS → INC Press INC/ABS;

INC → ABS Press INC/ABS;

SDM →INC Press INC/ABS to enter ABS or INC.If in ABS,press INC/ABS again.

SDM →ABS Press INC/ABS to enter ABS or INC. If in INC, press INC/ABS again.

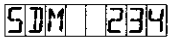
INC → SDM Press

ABS → SDM Press

2: Set the new number of SDM in SDM mode

STEPS:

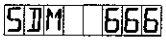
1: Enter SDM mode;



2: Press (two axies DRO) or (three axes DRO),message-window flashess ,waiting for inputting a new number of SDM;



3: Enter a new number ,for example, enter 6 6 6



4: Comfirm new SDM number

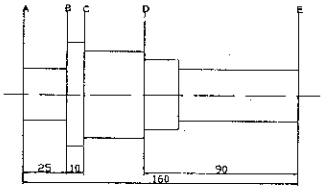
Press (two axes DRO) or (three axes DRO),then the message-window stops flashing and the number of SDM is changed to 666.

3: Increase/Decrease the SDM number

DRO return normal display state with the display mode SDM, press to decrease the number of SDM by 1; press to increase the number of SDM by 1.

Example : If the current SDM number is 777,and the message-window displays "SDM 777", press ,then the message-window will display "SDM 776", which means the current SDM number is 776.,

If the current SDM number is 777 and the message-window displays "SDM 777", Press ,then the message-window will diaplays "SDM 778",which means the current SDM number is 778.



If a workpiece as the figure is to be machined where the datum plane is plane E, the coordinate can be set as the following steps:

1: Return normal display state with ABS coordinate;



2: Move the machine table until the lathe tool is aligned with plane E,then zero X axis;

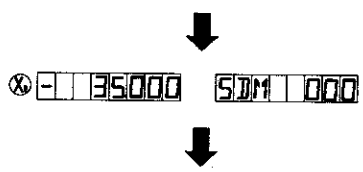


3: Move the machine table until the lathe tool is aligned with the plane D, change SDM number to SDM 000 ,and press ⓧ to zero X axis .Then the NO.000 SDM coordinate's datum is set at plane D.



4: Move the machine table until the lathe tool is aligned with plane C, press ⇩ to change SDM to SDM 001,

Then press ⓧ to zero X axis ,and the SDM 001 with the datum plane C is set.



5: Move the machine table until the lathe tool touches the plane B,the DRO will display as the right:



6: Move the machine table until the lathe tool touches the plane A, the DRO will display as the right:



2.8 Clearing All SDM Datum

Function: Clear the Datum of all SDM 0—999. After clearing ,the display value in SDM coordinate is equal to the value in ABS coordinate.

STEPS:

1: Return normal display state;

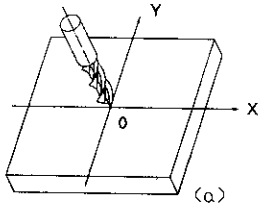
2: Press INC/ABS and AC simultaneously for 2 seconds,and the message window displays"CLS SDM" flashingly ,which means it is clearing now.About ten seconds later,the clearing is completed , "CLS OK" is displayed in message window tempolary and DRO return normal display state.

2.9 Finding the Absolute Reference Point of Scale (RI)

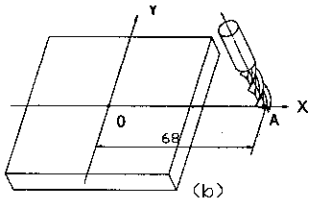
Function:

A absolute datum should be set when a workpiece is machined. There are two cases which is often met

- The machine table can't stop but continue going further because of inertia if power is off suddenly when the matchine table is going in full speed.There will be distance Δ L between the spot and the position the DRO memorize.That is to say the display value is not the actual value of the position when power is on again.



➢ If the machine table is moved without intention when DRO is off.How to restore the preset ABS and correct display value?



These questions can be solved easily with this function of search RI.

STEPS:

1：DRO is set in ABS coordinate.

2：Press [RI],then the message window displays "SEL AXIS";

3：Select the axis which need search RI. For instance,select Y axis,then press [Y] ,"FD.Y REF" is displayed in message window,and Y window flashes.

4：Move the machine table.The buzzer sounds when RI is searched,.then Y window stops flashing and displays the value of the current position,the DRO returns normal display state.

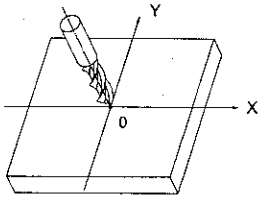
In the course of searching ,press [AC] to quit this operation.



The machine table is moved when DRO is off. How to restore the former absolute ABS coordinate and correct display value?

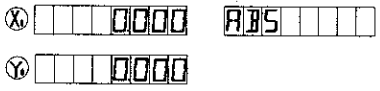
Take WE6800M-2 as an example .

STEPS:



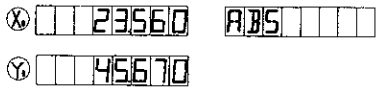
1) This operation (searching the absolute origin point of the scale) is necessary when an linear scale is installed or the default parameter is loaded .If not ,the ABS coordinate would not be restored.

2) Set the point O as the datum of ABS. (Move the machine table until the lathe tool is aligned with point O, and zero the X axis, Y axis)



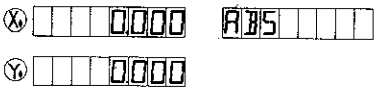
3) The machine table is moved when power is off ;

4) Power is on ,switch to ABS coordinate,the DRO maybe displays as the right:



5) Search the RI of X axis andY axis.after RI is found , the ABS coordinate is restore .

6) Align the lathe tool with point O, "0.000" is displayed in X window and Y window,which means the point O is the origin and the ABS coordinate is restored.



NOTE:

➢ The linear scale has a RI every 50 mm. For the sake of search identical RI,move the scale around

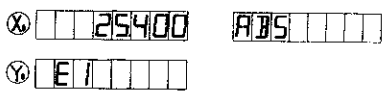
the red mark "△" to search RI.

➢ Setup correct RI mode is a premise

2.10 Clearing the Error message

If ERROR message is enabled, the message window will display"E1" if the signal of phase A and phase B of the linear scale changes at the same time; the message window will display "E2" if the linear scale runs too fast ; the window will display "E3" if these two conditions occur simultaneously. When error information appears, the display value has an error of 1-2 count.so user need search RI to restore ABS coordinate If user think that doesn't affect your work,press [AC] to clear error message and continue your work.

Example : When signal of A phase and B phase is same in Y axis the window displays as the right:

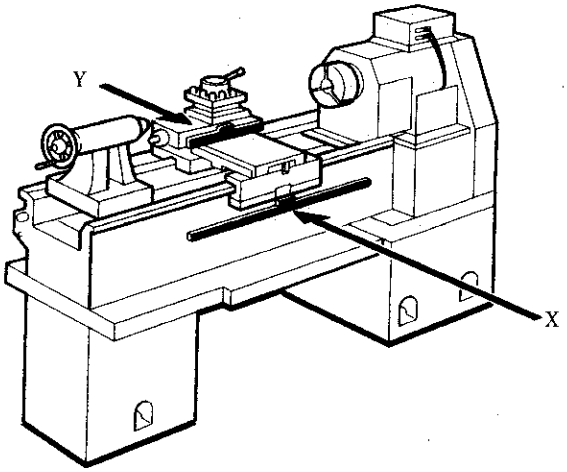


Press [AC] to clear the error information. Y window displays the value still,but it is error.The difference between the display value and the true value is about 1—2 times of resolution.For instance ,the resolution of scale is 5μ,the difference is 5-10μ.



2.11 Lathe Function

As the following figure showing, if two scales are installed in one axis ,the position of the workpiece should be the sum of these two values(X+Y) in this direction. It is called lathe function.



A. lathe mode 0: normal display (the lathe function is disabled)

B. lathe mode 1 : X window value=the value of X axis position + the value of Y axis position

C. lathe mode 2 : X window value=the value of X axis position + the value of Z-axis position

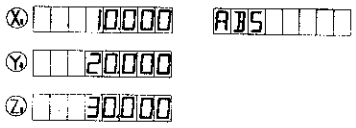
STEPS:

1: Set the lathe mode in initial system settings;

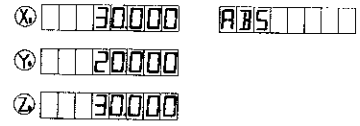
2: In normal display state,press [X+Y/Z] (three axes display) or [X+Y] (two axes display) to enter lathe function.Then the LED of the lathe function will be on (If the lathe mode is 0,the lathe function is disabledand the LED is off);

3: In lathe state, press [X+Y/Z](three axes display)or [X+Y](two axes display)to exit the lathe function,and the LED turns off.

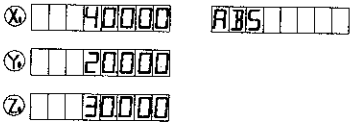
A If in normal display state, the value of the position is as the right:



B In lathe mode 1, the DRO will display as the following :
X window display value= value of X axis position + value of Y axis position



C: In lathe mode 2,the DRO will display as the following :
X window display value =value of X axis position + value of Z axis position



2.12 Display value filter

When machine a workpiece by grinder, the display value varies quickly due to the vibration of grinder. User can't see display value clearly. WE6800 series DRO provides display value filter fuction to disable the quck change of display value

STEP:

1) Enter display value filter

In normal display state, press [TM] and [ENTER] simultaneously,enter display value filter

2) Exit display value filter

press [TM],exit display value filter

Chapter 3 1000 group SDM coordinate

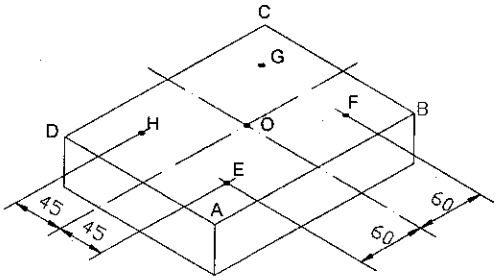
WE6800 has three display modes: the absolute mode(ABS),the incremental mode(INC)and the 1000 group second data memory (SDM 0—SDM999).

ABS datum of the workpiece is set at the beginning of the processing and the 1000 group SDM is set relative to ABS coordinate.

1000 group SDM coordinate can be divided into several segments,and every segment stores data of one workpiece.If one segment has 20 group SDM coordinate,DRO can be divided into 50 segments and can store data of 50 workpieces.

SDM 000 ------ SDM 019 data of the first workpiece
SDM 020 ------ SDM 039 data of the second workpiece
SDM 040 ------ SDM 059 data of the third workpiece
.....
SDM 960 ------ SDM 979 data of 49th workpiece
SDM 980 ------ SDM 999 data of 50th workpiece

Example : The ABS datum is the center point O , the point E, F, G, H needded processing are set as datum of SDM 000 —SDM 003.



Two ways to set SDM coordinates:

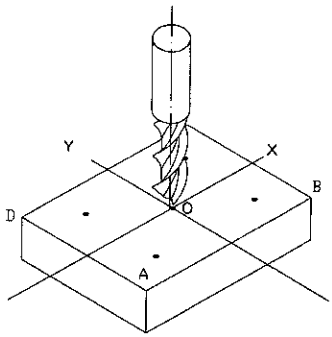
1） Zeroing at the current point ;
2） Presetting datum of SDM coordinate

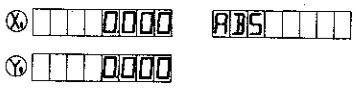
3.1 Zeroing at the Current Point

At first set the center point of the workpiece as the origin of the ABS, then align the lathe tool with point E,F,G,H by moving the machine table and zero them.It is the position to process where the "0.00" appears in X window,Y window by moving the machine table whether in ABS or in SDM coordinate.

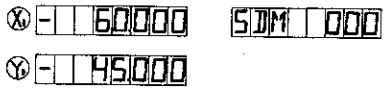
STEPS:

1. Set the center point O as the datum of ABS
 Make line AB parallel to X axis,line AD parallel to Y axis.
 When position lathe tool to point O
 Zero X axis,Y axis in SDM 000
 Zero X axis,Y axis in SDM 001
 Zero X axis,Y axis in SDM 002
 Zero X axis,Y axis in SDM 003

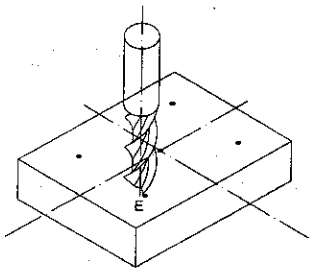


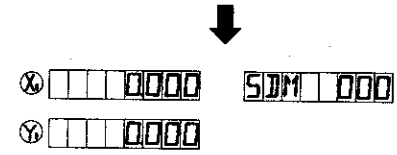


2. Set the point E as the datum of SDM 000
 SDM 000 ,align the lathe tool with point E and zero X axis,Y axis;DRO displays as the right:

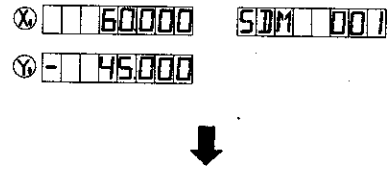


Press X_0, Y_0

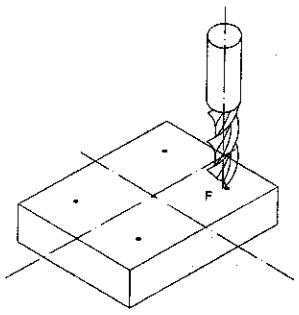


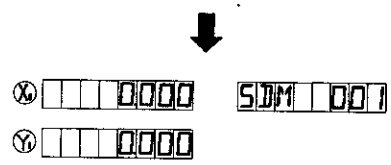


3. Set the point F as the datum of SDM 001
 In SDM 001 and align the lathe tool with point F ,then zero X axis,Y axis; DRO displays as the right :

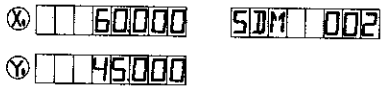


Press X_0, Y_0

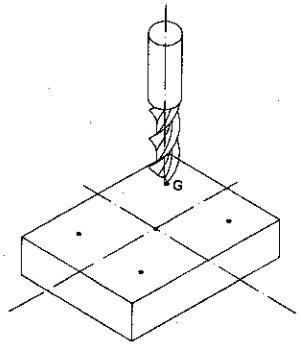


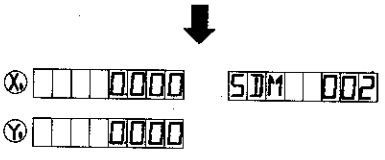


4. Set the point G as the origin of SDM 002
 In SDM 002 ,align the lathe tool with point G,and zero X axis,Y axis; DRO displays as the right:

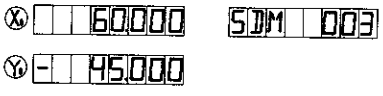


Press X_0, Y_0

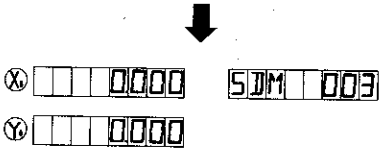


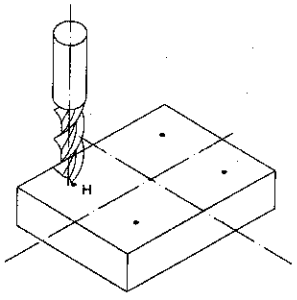


5. Set the point H as the origin of SDM 003
 In SDM 003 ,align the lathe tool with point H,and zero X axis,Y axis; DRO displays as the right:



Press X_0, Y_0;





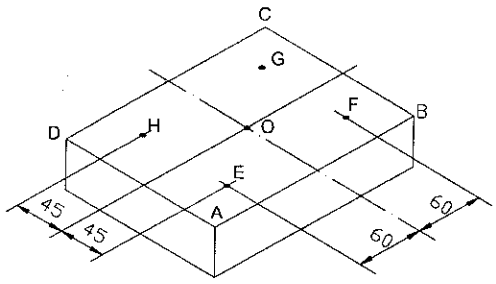
6. Machine the workpiece according to the preset SDM coordinate;
7. Machine another workpiece according to the same blueprint ;You only need set the center point as the datum of ABS .It is no necessary to set SDM coordinate again ,as SDM can be set automatically.Point E,F,G,H is the zero point of SDM 000,SDM 001,SDM 002,SDM 003

respectively.Point can be machined when enter corresponding SDM coordinate and "0.000" appears in screen by moving machine table.This function can save great plenty of time, in production.

3.2 Presetting datum of SDM Coordinate

Compared with the way of zeroing at current point, the another way(presetting datum of SDM coordinate) can set zero point of SDM more accurately and quickly without moving the machine table .

As the illustration, certer point is the datum of ABS, the position of point E,F,G,H is (-60, -45, (60, -45), (60, 45), (-60, 45) in ABS coordinate.



A Enter SDM 000 and preset the position of point O as (60, 45) ,which means the point E is the datum of SDM 000 ;

B Enter SDM 001,preset the position of point O as (-60, 45) ,which means the point F is the datum of SDM 001;

C Enter SDM 002,preset the position of point O as (-60, -45),which means the point G is the datum of SDM 002;

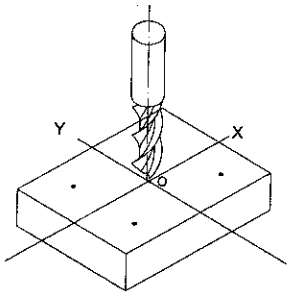
D Enter SDM 003,preset the position of the point O as (60, -45) ,which means the point H is the datum of SDM 003;

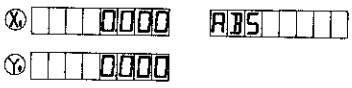
Pay attention that the preset value is negative to the actual value of position in ABS. If set "SDM DIR" as "1" in initial system settings,the caution is no necessary. The value DRO accepts is equal to the negative of the enter value.

STEPS :

1 Set"SDM DIR" as "1" in intial system settings;

2 Set the center point of the workpiece as the datum of ABS; Line AB is parallel to X axis,line AD is parallel to Y axis. Move machine table, align the lathe tool with point O





3 Set point E as the datum of SDM 000;
Enter SDM 000

The position of point E is (-60, -45) ,press

[X] [6] [0] [+/-] [ENTER] in turn;

[Y] [4] [5] [+/-] [ENTER] in turn;





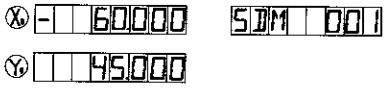
4 Set point F as the datum of SDM 001;
Enter SDM 001

The position of point F is (60, -45) ,press

[X] [6] [0] [ENTER] in turn ;

[Y] [4] [5] [+/-] [ENTER] in turn;





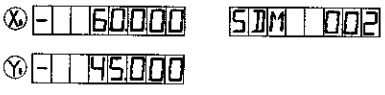
5 Set point G as the datum of SDM 002;
Enter SDM 002

The position of G is (60, 45) ,press

[X] [6] [0] [ENTER] in turn;

[Y] [4] [5] [ENTER] in turn;





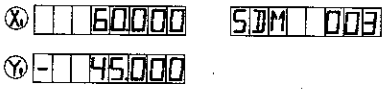
6 Set point H as the datum of SDM 003;
Enter SDM 003

The postion of point H is (--60, 45) ,press

[X] [6] [0] [+/-] [ENTER] in turn;

[Y] [4] [5] [ENTER] in turn;





Chapter 4 SPECIAL FUNCTION

WE6800 series DRO has special function as the following except mesuring and positioning:

Bolt Hole Circle(BHC);

Bolt Holt Line(BHL);

ARC Processing(only for WE6800M-2, WE6800M-3);

Slope Processing (only for WE6800M-2, WE6800M-3);

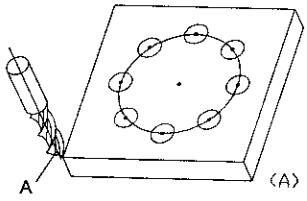
Electrode discharging machining(EDM, only for WE6800E);

Please refer **Coordinate System** (in Chapter 1.) before reading this section.

4.1 Bolt Hole Circle

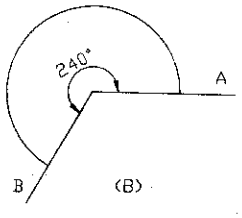
Function despription:

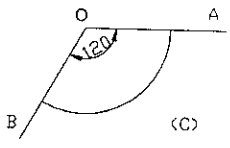
WE6800 series DRO has the function of BOLT HOLE CIRCLE(BHC) .This function can simplify the pressing of multiple holes which are attributed equally around the circumference of a circle.The DRO will guide operator to enter the following parameters:



RADIUS	Radious of circle
ST.ANGLE	Starting angle that the center of the first hole on the circle
END.ANGLE	Ending angle that the center of the last hole on the circle
HOLE NUM	Hole number
DIRECT	Angle direction.

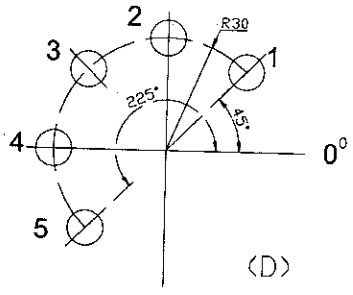
Angle direction has two: clockwise and counterclockwise. "0" indicates that it is counterclock from ST.ANGLE to END.ANGLE; "1" indicates that it is clockwise from ST.ANGLE to END.ANGLE. As the following figure, the ST.ANGLE is 0°,END.ANG is 240°. The figure (B) illustates the arc while angle direction is counterclockwise; figure (C) illustrates the arc while angle direction is clockwise.





As figure (D) illustrates, machine a hole every 45 deg from 0 °– 225 °. Parameters are as the following:

RADIUS	20
ST。ANGLE	45
ENDANGLE	225
HOL NUM	5
DIRECT	0

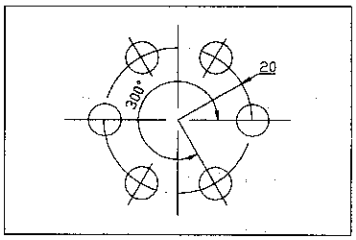


NOTE: If ST.ANGLE equals END.ANGLE ,the holes are attributed equally around the whole circumference.

The positions of the hole center are calculated automatically. Press ⇩ or ⇧ to choose the hole No. and move the machine table until the "0.000" appears in X window,Y window.It is the position to process a hole.

Example: Machine holes on circumference as the figure (E).

RADIUS	20mm
ST.ANGLE	0°
END.ANGLE	300°
HOLE NUM	6
DIRECT	0

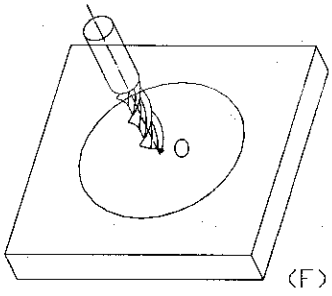


(E)

STEPS:

1: Set display unit to metric;

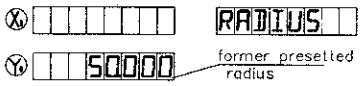
Move the machine table until the machine tool is aligned with the center of the circle,then zero X axis,Y axis.



(F)

2: Press [⊙] to enter Bolt Hole Circle function.

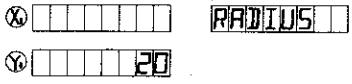
If all parameters have been set, press [ENTER] to precess directly.



3: Enter radius

Y window displays the formerly presetted radius,message-window displays "RADIUS".

Press [2] [0] [ENTER] in turn.



NOTE:

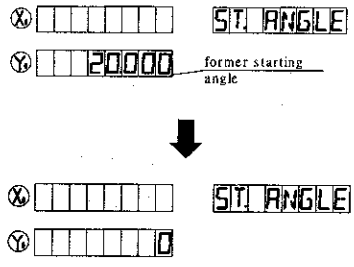
If "0" is inputted as the radius,the DRO will be requested to input again.

If incorrect parameter has been entered and you haven't press [ENTER], press [AC] to cancle and input again;If you have pressed [ENTER] and begin to set another parameter , you should press [⇧] to return RADIUS set and input again.Other parameters can be deal with in the same way.

4: Input ST.ANGLE

Message window displays "ST.ANGLE", Y window displays the former presetted starting angle.

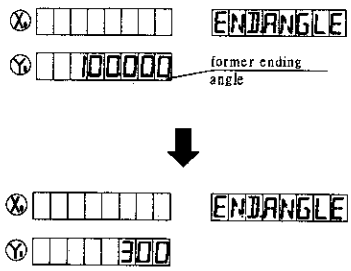
Press [0] [ENTER] in turn;



5: Input ending angle

Message window displays "END.ANGLE",Y window displays the former angle.

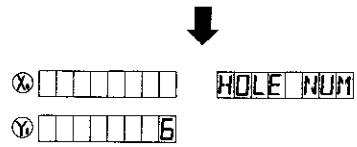
Press [3] [0] [0] [ENTER] in turn.



6: Input the number of hole

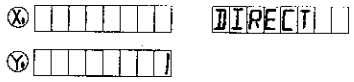
Message-window displays "HOLE NUM" ,Y window displays the former number,

Press [6] [ENTER] in turn.



NOTE:

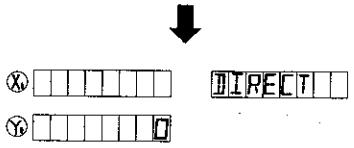
If "0" or "1" is inputted as the number of hole, the DRO will point out this mistake and remind inputting again.



7: Input angle direction

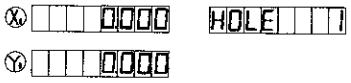
Message-window displays "DIRECT" Y window displays the former presetted direction;

Press [0] [ENTER] in turn;



8: Message window displays "HOLE 1";

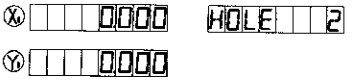
It is the position of the first hole to punch where the "0.000" is displayed in X window,Y window by moving the machine table.



9: After finishing the first hole, press [⇩]

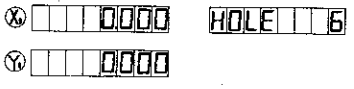
Message window displays "HOLE 2";

Move the machine table the "0.000" is displayed in X window andY window, it is the position of the second hole



NOTE:

Press [⇧] or [⇩] to change holes number.



10: Process the holes 3th –6th in the same way.

11: After processing all holes , press [○] to return normal display state.

NOTE: In the course of BOLT HOLE CIRCLE processing ,pressing [XYZ] (three axes display) or [XY] (two axes display) can leave BOLT HOLE CIRCLE function temporarily and return normal display state in order to check the position ,and press [XYZ] (three axes display) or [XY] (two axes display) again to return BOLT HOLE CIRCLE function.

4.2 Bolt Hole Line

Function: WE6800 series DRO provides BOLT HOLE LINE(BHL) function.This function can simplify the processing multiple holes whose centers are attributed equally on one line.

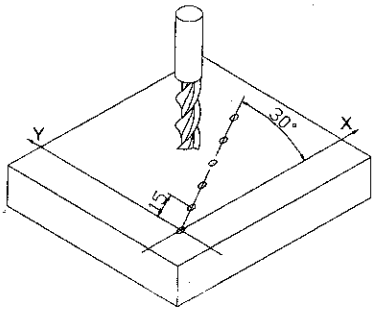
Only the following parameters are to be input:

LINE DIS	Line distance (distance between the center of first hole and the center of the last hole)
LINE ANG	Line angle (angle between the line and the positive X axis)
HOLE NUM	Number of hole

DRO will calculate the positions of the hole after all the parameters have been entered. Press [⇩] or [⇧] to select the No.of hole and move the machine until "0.000" is displayed in X window and Y window. It is the position of hole to machine.

Example:

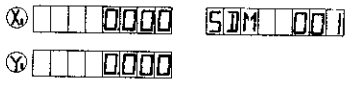
LINE DIS	150mm
LINE ANG	30°
HOLE NUM	6



STEPS:

1: Set display unit to metric and the shrinkage is not taken into consideration.

Move the machine table until the machine tool is aligned with the center point of the first hole ,and zero X axis,Y axis.

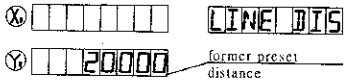


2: Press [∠] to enter BOLT HOLE LINE function;

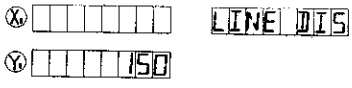
If all parameters have been entered, press [ENTER] to start processing directly.

3: Input line distance

Y window displays the former presetted line distance,and the message-window displays "LINE DIS".



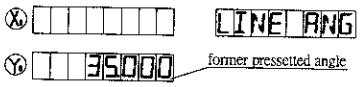
Press [1] [5] [0] [ENTER] in turn;



NOTE:If "0" is input as the line distance ,the DRO will not accept and rimind the operator to input again.

4: Input line angle

The message-window displays "LINE ANG",Y window displays the former presetted line angle.



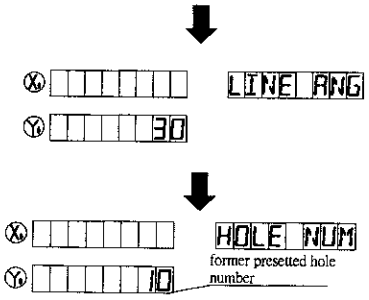
Press [3] [0] [ENTER] in turn.

5: Input the number of hole

Message-window displays "HOLE NUM",Y window displays the former presetted hole number.

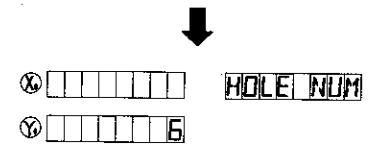
Press [6], [ENTER] in turn , processing begins

NOTE: If "0" or "1" is input as hole number,DRO will not accept and remain user to input again.



6: Message window displays "HOLE 1";

Move the machine table until "0.000"appears in X window,Y window ,and it the center of the first hole to punch.

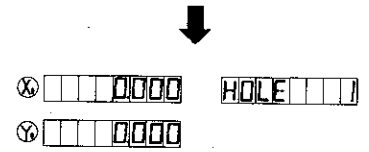


7 : After finishing the first hole, press [⇩], and the message-window displays "HOLE 2 ";

Move the machine table until "0.000"appears in X,Y window, then you can punch the second hole at this point.

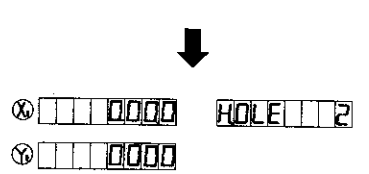
NOTE:

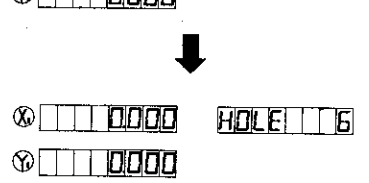
Press [⇧] or [⇩] to conver among holes.



8: Process the holes 3th –6th in the same way.

9: Press [📈] to return normal display state when finishing prosessing.





NOTE:

In the course of BHL processing , you can press [XYZ] (three axes display) or [XY] (two axes display) to leave this function temporarily and return normal display of X,Y,Z-axis in order to check the position which the DRO calculated,then press [XYZ] (three axes display) or [XY] (two axes display) again to return BHL function.

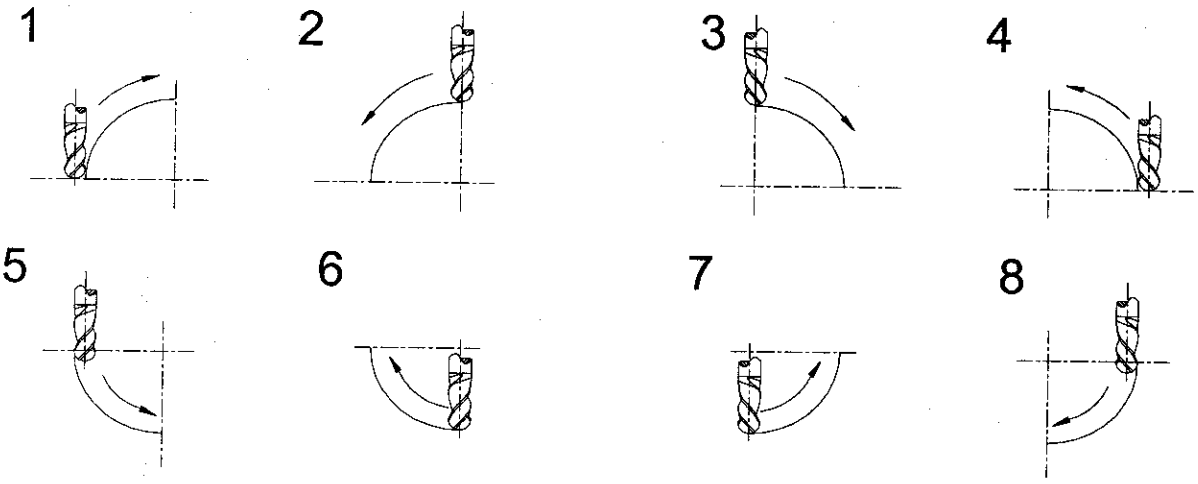
4.3 ARC Processing

This function is only for WE6800M-2 , WE6800M-3 .

It is very wastful to use numerical control lathe to process arc in the simple product or small production.This function make it convenience to process arc with normal lathe .Parameter "MAX CUT' is the arc length each process. The smaller the MAX CUT, the more smooth the arc plane, the longer processing time.

A : Process XZ,YZ plane

There are 8 mode as the following when processing arc in XZ,YZ plane:



Milling cutter may be flat-bottomed or arc-bottomed. If flat-bottomed , set the tool diameter as 0;

B: Process XY plane

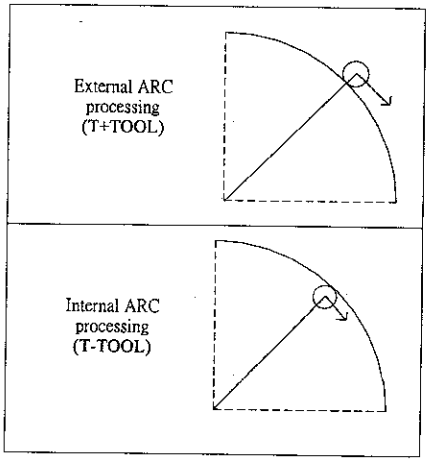
DRO provides the above 8 modes in processing XY plane. The milling cutter is perpendicular to the machine plane.DRO has internal ARC processing and external ARC processing for each type:

External T+TOOL,

Internal T- TOOL.

Set the tool radius according to the actual milling cutter when process XY plane.

Tool compensation direction(when process XY plane)

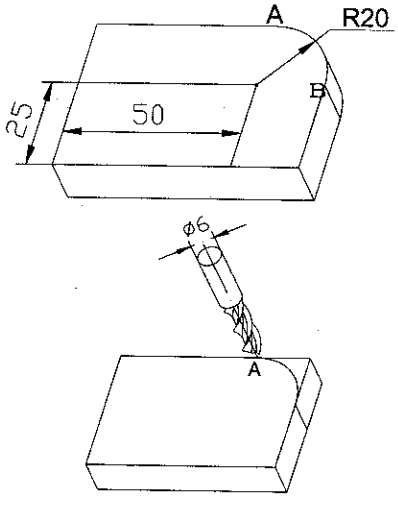


Enter the following data for ARC processing:

	TYPE 1 - 8	Mode of the ARC processing
*	T+TOOL / T-TOOL	Selection between T+TOOL/T—TOOL (This parameter is only for XY plane)
	RADIUS	The radius of ARC that is to be processed
	TOOL DIA	Tool diameter
	MAX CUT	Feed step

Example 1:

Process an arc AB of 90° from point A to point B as the figure.



Parameters are as the following:

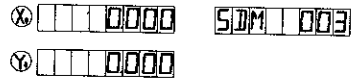
Machine plane	XY
ARC mode type	3
T + TOOL	
RADIUS	20mm
TOOL DIA	6mm
MAX CUT	0.5mm

Shrinkage is not taken into consideration.

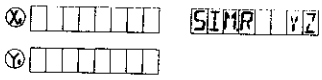
STEPS:

1: Set display unit is metric, and the LED of the shrinkage is off.

2: Move the machine table until the lathe tool is aligned with point A,then zero X axis,Y axis;







3: Enter ARC processing state;

Press [R] to enter ARC processing state.



If all parameters have been set,press [ENTER] to process directly.

4: Select machine plane;

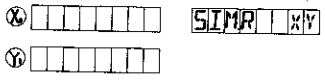
Press [X] , [ENTER] to select XY.

NOTE:

[X] indicates XY plane;

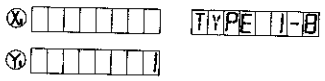
[Y] indicates YZ plane;

[Z] indicates ZX plane;





You can also press [TN] (two axes display) or [3N] (three axes display) to switch plane among XY plane,YZ plane, ZX plane.

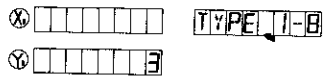


5 : Select processing mode:

Message-window displays "TYPE 1—8", Y window displays the former processing mode;

Press [3] , [ENTER] in turn to enter ARC type;





6 : Select T + TOOL mode:

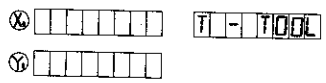
Press [+] , [ENTER] to select the external arc processing ;



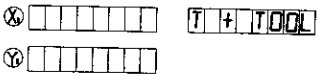
NOTE:

[+] indicates T + TOOL mode(external arc processing);

[-] indicates T – TOOL mode(internal arc processing).



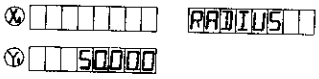




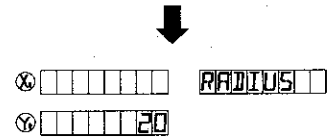
7 : Set ARC radius

Message-window displays "RADIUS",Y window displays the former arc radius;



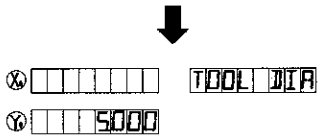


Press [2] [0] [ENTER] in turn to input the arc radius.



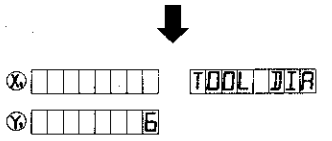
NOTE:

If "0" as the arc radius is input , the DRO will not accept the "0" and wait another number.

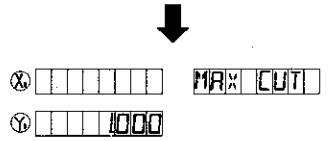


8 : Set Tool diameter

Message-window displays "TOOL DIA";
Y window displays the former presetted diameter



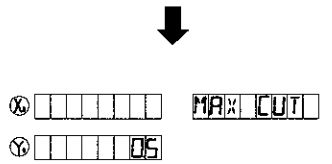
Press [6] , [ENTER] in turn to enter the tool diameter.



9 : Set the feed step

Message-window diswplays "MAX CUT";
Y window displays the former feed step.

Press [0] [.] [5] [ENTER] in turn to input the feed step:

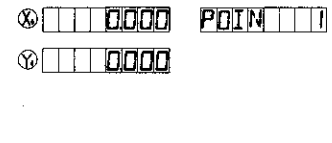


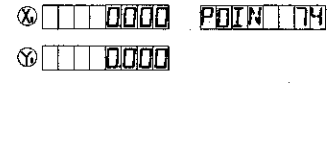
NOTE:

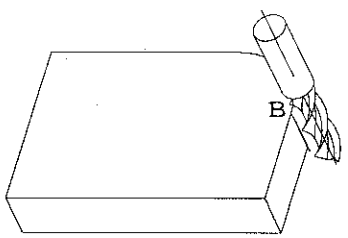
If "0" is inputted as the feed step,the DRO will not accept and wait for inputting another data.

10 : Process ARC

Messaage-window displays "POIN 1".Process until the "0.000" appears in X window,Y window.You have finished the first point. Press [⇩] to switch to the second point and repeat the same speed .Press in this way until the message-window displays "POIN 74".Pressing [⇧] or [⇩] can select processing point.







11 : Press [B] to exit ARC processing after machining is over.

NOTE:

① In the ARC processing , pressing (three axes display) or (two axes display) can leave this function temporarily to return normal display of X,Y,or Z-axis in order ot check the position the DRO has calculated.Press (three axes display) 或 (two axes display) to return ARC function.

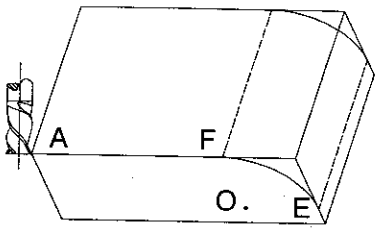
② Processing or can switch among the parameters in the course of the presetting paramer.

Example 2:

Process the ARC EF as the figure from point E to point F.

Parameters are set as following:

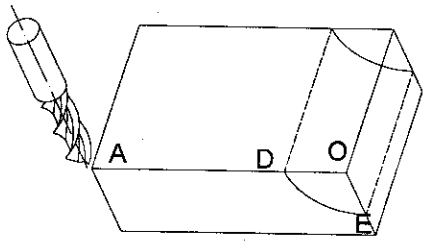
Machine plane:	XZ
TYPE:	4
RADIUS:	Actual radius of the arc
TOOL DIA:	0 (flat-bottomed tool)
MAX CUT:	preset as the costumer



Example 3:

Process the ARC DE as the figure from point D to point E. Parameters are as the following:

Machine plane:	XZ
TYPE:	6
RADIUS:	Actual radius of the arc
TOOL DIA:	Actual value (actual tool)
MAX CUT:	preset as the costumer

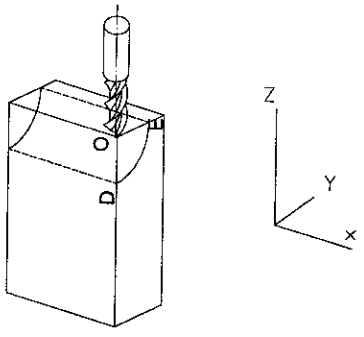


Example 4:

Process the ARC DE as the figure from point D to point E.

Parameters are as the following:

Machine plane:	YZ
TYPE:	7
RADIUS:	Actual radius of the arc
TOOL DIA:	Actual value (actual tool)
MAX CUT:	preset as the costumer



4.4 Slope Processing

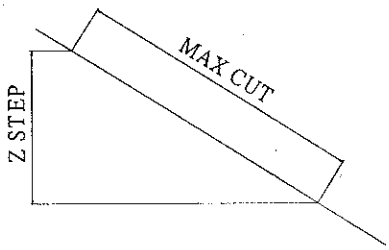
This function is only for WE6800M-2, WE6800M-3.

Function: This function can calculate the position of every processing point automatically in processing slope.Only the following parameters need to be inputted:

INCLE : Set machine plane XY,YZ or XZ plane

INCL.ANG : the inclination angle of the slope

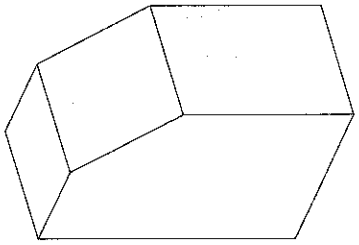
MAX CUT: the slope length each time processing



NOTE:

Z STEP and MAX.CUT are defined as the figure.

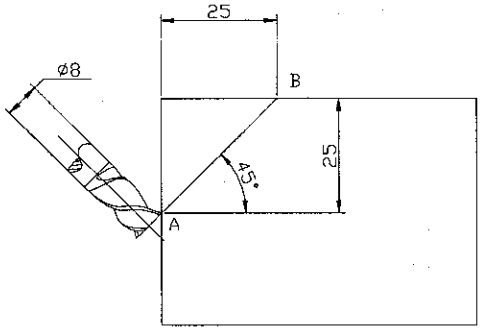
DRO will calculate the position of each processing on the slope automatically when all parameters have been input. Press ⇧ or ⇩ to select the processing point and process until "0.000" appears in the window.



Example 1:

Process the slope AB as the figure. The parameters are as following:

INCLE:	XZ
INCL.ANG	45°
MAX.CUT	1.2mm



STEPS:

1: Set display unit to metric;

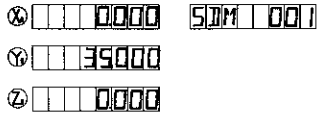
Set the SLOP.MODE 1 in initial system settings.

NOTE:

If the third parameter is Z STEP, Set the SLOP.MODE 0.

Move the machine table until the lathe tool is aligned with the starting point A,then zero X axis,Z axis.

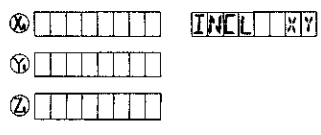
Press Ⓧ₀, Ⓩ₀ in normal display state.





2 : Press ⇘ to enter slop processing

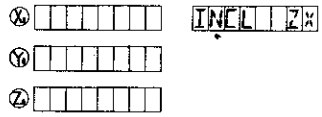
Press ENTER to start processing directly if all parameter have been set.





3 : Select machine plane:

Press [Z], [ENTER] in turn to select the XY plane.



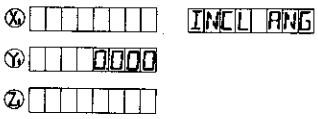
NOTE:

Pressing [X] indicates XY plane;

Pressing [Y] indicates YZ plane;

Press [Z] indicates ZX plane;

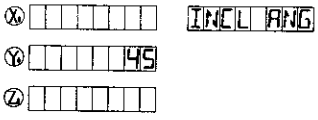
You can also press [2D] (two axes display) or [3D] (three axes display) to switch among XY plane, YZ plane or ZX plane.



4: Enter INCL.ANG

Message-window displays "INCL ANG", Y window displays the former INCL.ANG.

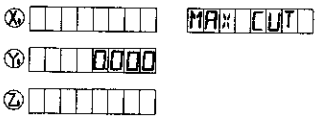
Press [4] [5] [ENTER] in turn.



5: Enter MAX.CUT

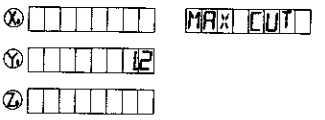
Message-window displays "MAX CUT",Y window displays the former MAX.CUT.

Press [1] [.] [2] [ENTER] in turn;



NOTE:

If "0" is inputted as MAX CUT, DRO will not accept and wait for another data .



6 : Processing

Message-window displays "POIN 1";

Process slop until the "0.000" appears , thern press [↓] to process the next point.

7 : Press [↑] or [↓] to select points

8 : Press [ESC] to return normal display state after processing is over.

4.5 Auto Edge Detection

Function:

- searching boder automatically;
- measuring dimension of work-piece; ③searching the center of work-piece.

NOTE: This is an additional funtion. It need pay addtional.

Example:

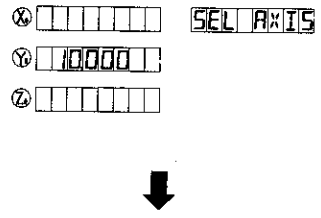
Radius of EDGE DETECTOR 5 mm
Work-piece dimension on X axis 65 mm
Measure by using the linear scale installed at X axis.

STEPS:

1 : Set display unit to metric.

2 : Press [X>Y] (three axes display) or [X>Y] (two axes display) . to enter AUTO EDGE DETECTION.

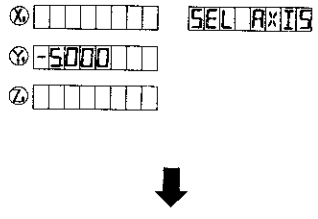
Message-window displays "SEL AXIS",
Y window displays the radius of the edge detector, the sign of the value displayed is the sign when the detector touches the first edge.



3 : Input the radius and sign of the detector.

Press [5] [+/-] [ENTER] in turn , then the Y window displays "—5.000".

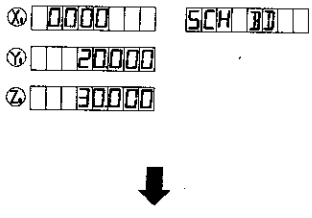
NOTE : You can skip this step if the diameter is set well.



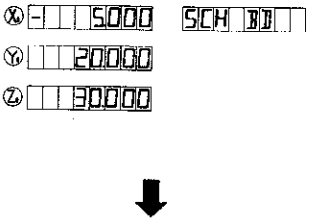
4 : Select axis.Press [X] to select X axis.

"0.000" flashes in X window, waiting for detecting edge.
Y window, Z-window display the value of the current position.

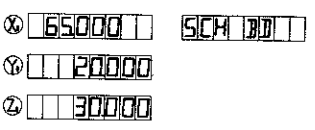
Press [Y] to select Y axis ; press [Z] to select Z-axis in the same way



5 : Move the EDGE DETECTOR to touch the first edge , then the X window will display the position of the detector with "—5.000".The displayed value in X window is the measure value. You can touch the edge many times.



6 : Move the EDGE DETECTOR to touch another edge. The X window will show the length of the work-piece with "65.000";



7 : Press [1/2] to exit this function. Move the EDGE DETECTOR until the X window displays "0.000", which means that this position is the center of the work-piece at the X axis direction.

NOTE:

1: Pressing  (three axes display) or  (two axes display) will exit this function when in EDGE DETECTION function.

2 : If you detect edge only, you needn't do step 6 and 7 .

3 : If do not find the center point, you needn't do step 7.

Chapter 5. EDM

(ELECTRICAL DISCHARGE MACHINING)

Note: Only WE6800E provides EDM function.

DRO will send out a signal and machining will stop as soon as the display value is equal to the expectant .

WE68000E provides 6 EDM modes:

MODE 1	manual mode 1
MODE 2	automatical mode 1
MODE 3	manual mode 2
MODE 4	manual mode 3
MODE 5	manual mode 4
MODE 6	automatical mode 2

EDM mode is set in initial system settings .

NOTES: Pay attention to the relay mode.

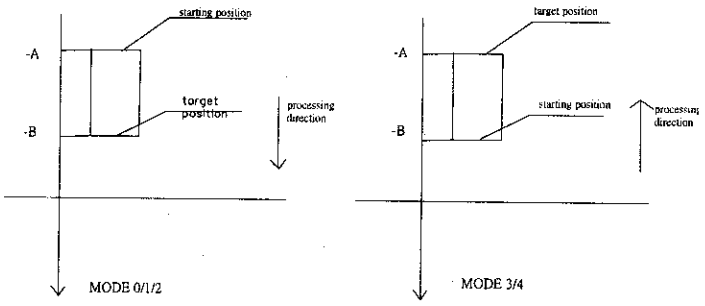


Fig 1 : Difference among EDM modes

Table 1: the difference between 6 EDM modes:(X:No have; ∨:Have; ↑:Up; ↓:Down)

EDM MODE	Edge detect	Direction of machining as depth is minus	Exit EDM after maching first hole	Z axis direction
1	X	↓	∨	↓
2	∨	No minus deepth	X	↓
3	X	↓	X	↓
4	X	↑	∨	↓
5	X	↑	X	↓
6	∨	↓ (no plus depth)	X	↑

Positive direction of Z axis is down except mode 6,which means the display value will increase with the increasing depth during machining .

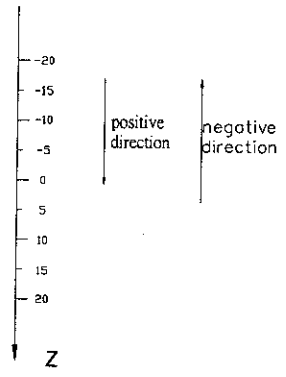


Fig 2

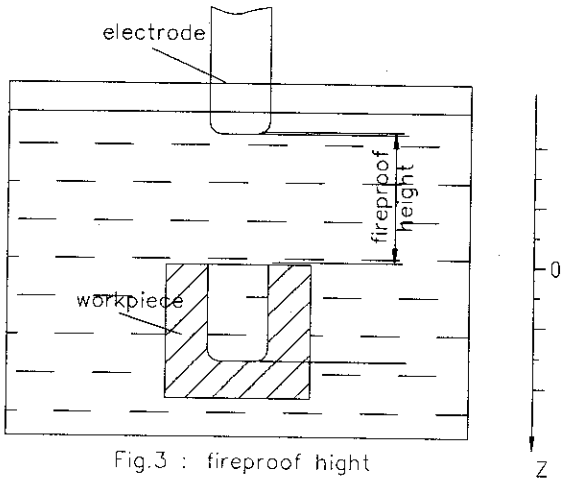


Fig.3 : fireproof hight

WE6800E provides fireproof function.During EDM,charcoal will be produced on the machined surface.With accumulating charcoal ,the electrode will beyond liquid level,which could lead a fire.If fireproof height is set,EDM will stop ,the DRO will send an alarm and fire is avoided .

WE6800 DRO OUNTER

OPERATION MANUAL

WE6800-2

WE6800-3

WE6800-EDM

Please read this manual before your operation, and place it at where easy to take

Rational Precision Instrument Co. LTD

DIRECTORY

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0. FORWARD

Attention points for installation, application and maintenance of WE6800 DRO

Note: The document and specifications will be changed without notice.

0.1 Installation environment

(1) Avoid exposing under the Sun or high temperature environment. And the operating temperature is 0℃ to 40℃;
(2) Keep away from high voltage, large current or strong magnetic machines; Signal cable should be kept away from power line;
(3) Avoid of installing in the oil, water or dust and high vibration environment ; Don't install at the vibrational or unsteady worktable to avoid of fall or break down even hurt the worker;
(4) Keep away from corrosive chemicals;
(5) Metal avoid falling in or insert the DRO from the holes or groove lest electroshock or fire brought by short or touch dangerous voltage points;
(6) WE6800 DRO use 100V~250V、50~60Hz power. Be sure that grounding is OK. Pullout the plug of power in thunder.

0.2 Attention points for application of digital read-out

(1) Check if the appearance is undamaged after unpacking. Contact our company or distributors if any malfunction is found, never tear down to repair by yourself;
(2) Before switch off, don't open the shuck or pullout the plug of the linear scale;
(3) Don't press the power line with anything. And the power line should not interfere the run of machine or human walking. Ensure the current rating exceed the sum of current on power.

0.3 Ordinary maintenance

(1) Switch off the power when cleaning;
(2) Rub with soft dry cloth or cotton;
(3) Don't clean the external shuck with methyl benzene or ether;
(4) Front display window can be rubbed with alcohol or neuter detergent.

0.4 Occasion of repair

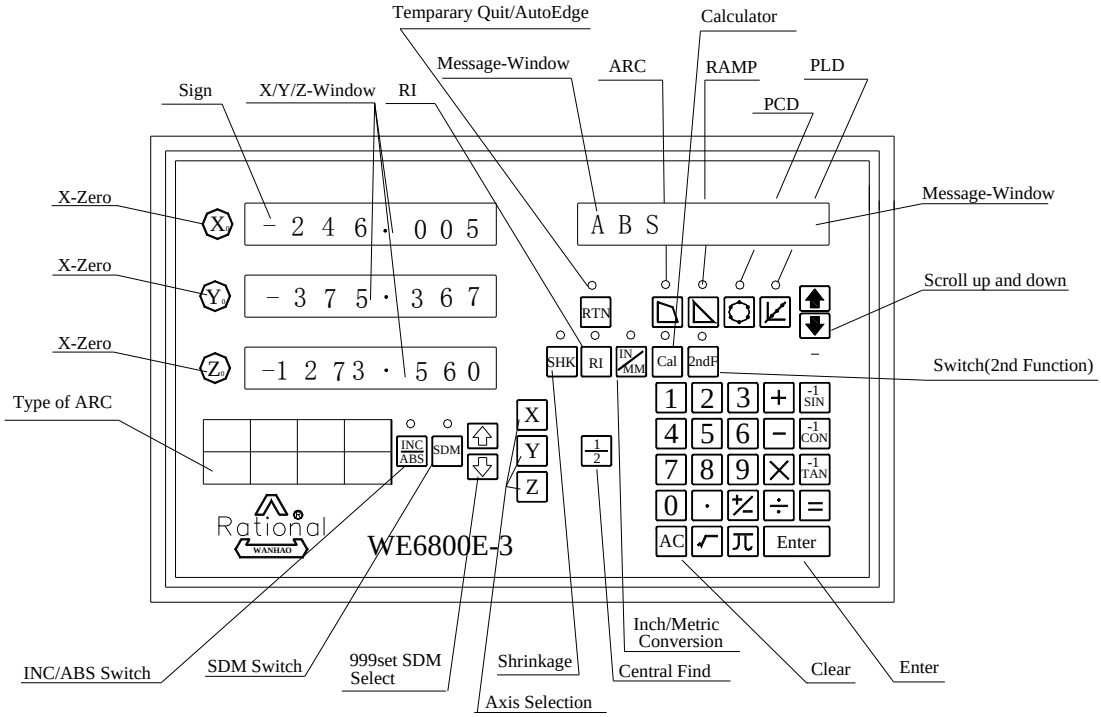
When the following events occurred, you should shut the power and contact the maintenance man to repair:
(1) The power plug mangled;
(2) Liquid is splashed on the DRO;
(3) DRO or the shell is damaged;
(4) DRO's performance transform abnormally;
(5) You operate according to the manual, but the DRO didn' work yet.

0.5 warranty

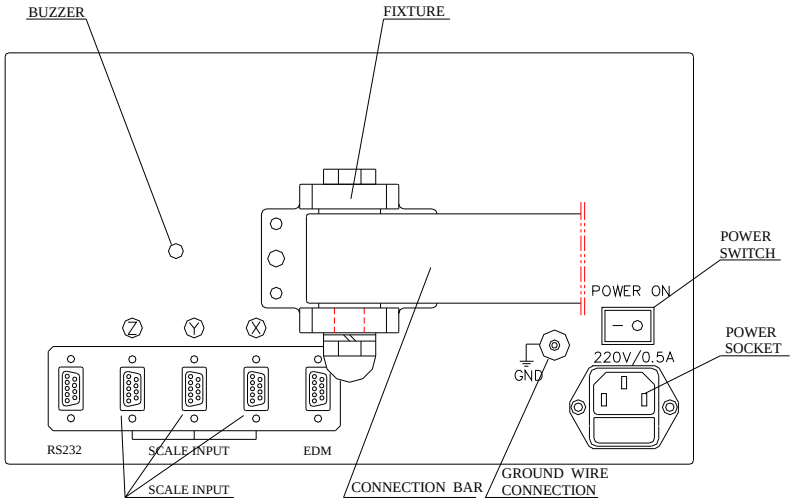
We guarantee maintenance the WE6800 DRO with the factory's original warranty. You must return the warranty card to our company. The valid warranty card must fill in with the specific model, machine NUM and date of installed.

1 PANEL, REAR PANEL AND KEY FUNCTIONS

1.1 Illustration of panel



1.2 Illustration of rear panel



1.3 Description of key functions

	KEY MARK	KEY NAME	FUNCTION INSTRUCTIONS	MILLING MACHINE	EDM	LATHE
1	X0 Y0 Z0	Clear to zero	Clear the display value of designated axis			
2	X Y Z	Select axis	Select axis			
3	IN/MM	Metric or imperial conversion	Toggle display unit between Metric or imperial conversion			
4	1/2	Central finding function	Display value divided by 2			
5	INC/ABS	Absolute/Incremental conversion	Toggle between ABS and INC coordinate			
6	RI	Search origin of the linear scale	Search origin to of the linear scale in ABS state			
7	SHK	Shrinkage	Convert between shrink and normal (unshrink)			
8	SDM	SDM coordinate	Provides 1000 programs auxiliary coordinate to preset processing point			
9	↓ ↑	SDM coordinate scroll up/down	Scroll in 1000 programs coordinate			
10	0 ---- 9	Numeral	Enter number			
11	·	Decimal point	Enter decimal point			
12	+/-	+/- sign	Plus or minus sign to a data number			
13	Enter	Enter	Confirm every enter operation			
14	AC	Clear	Clear incorrect operation			
15	RTN	Quit Temporary	Return to normal state temporarily			
16	Cal	Calculator	Enter or exit calculator			
17	2ndF	Switch (2nd function)	1 Calculate inverse trigonometric function in calculating state. 2 Enter SDM coordinate NUM.			
18	-1 SIN -1 CON -1 TAN	Trigonometric function	Calculating trigonometric and inverse trigonometric function			
19	+ − × ÷	Add, decrease, multiply, divide	Add, decrease, multiply, divide operator			
20	√	Radical sign	Square root or square			
21	π	Circumference ratio	Enter circumference ratio			
22	=	Equality	Confirm calculating result			
23	DEEP SET	EDM DEEP	Setup EDM processing depth	X		X
24	E.COMP	EDM COMP	Setup EDM processing electrode consuming	X		X
25	EDM	EDM processing	Enter EDM procession	X		X
26	⬡	PCD	Find the position of a series of points around a circle			

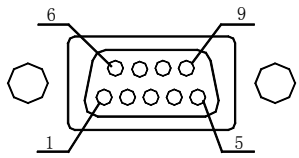
Continuation:

	KEY MARK	KEY NAME	FUNCTION INSTRUCTIONS	MILLING MACHINE	EDM	LATHE
27		PLD	Pitched Line Divid			
28		ARC	Process a certain plane of a work-piece to an ARC plane		X	
29		RAMP	Process a certain plane of a work-piece to an incline plane		X	
30		Lathe	Enter or exit lathe function	X	X	
31		Scroll up and down	Used to switch among process point in 26-29 items			

Remarks: *"*X*" indicates that there isn't such function.*

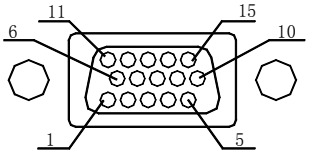
1.4 Pin assigment of Linear Scale Input

1) 9P D-Type Female



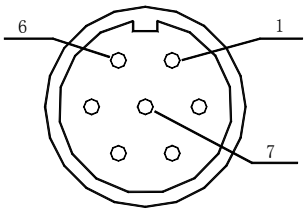
Pin No.	Signal Name	Color of wire
1	+5V	RED
2	0V	BLACK
3	A+	BROWN
4	B+	YELLOW
5	RI	ORANGE

2) High Density 15P D-Type Female



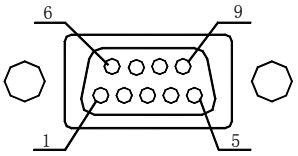
Pin No.	Signal Name	Color of wire
1	+5V	RED
2	0V	BLACK
3	A+	BROWN
4	B+	YELLOW
15	RI	ORANGE

3)DIN 7Pin Connector



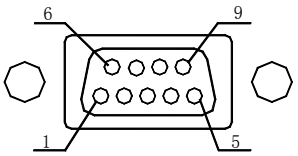
Pin No.	Signal Name	Color of wire
1	OV	RED
2	NC	
3	A+	BROWN
4	B+	YELLOW
5	+5V	RED
6	RI	ORANGE
7	FG	SHIELD WIRE

1.5 RS232 Interface



Pin No.	Signal Name	Color of wire
1	NC	
2	TXD	YELLOW
3	RXD	ORANGE
4	NC	
5	GND	BROWN
6-9	NC	

1.6 EDM Interface



Pin No.	Signal Name	Color of wire
1	NC	
2	PUBLIC	ORANGE
3	OPEN	BROWN
4	NC	
5	IN+	RED
6	CLOSE	YELLOW
9	IN-	BLACK

2 SETUP OPTION

Set up various parameters to operate the linear scale as the customer.

MENU ITEM	MEANING
SEL SYS	Active axis select
DIRECT	Change the direction of measurement for each axis.
LIN COMP	Set a linear error compensation ratio
R OR D	Toggle of displaying NORMAL to DIAMETER format for each axis
Z DIAL	Z-DIAL value
RESOLUTE	Select the resolution for measurement to display
RELAY.MOD	RELAY mode
EDM MODE	select the mode of EDM
SDM DIR	Select the input mode of SDM
ERROR	Enable / Disable error message display
SHRINK	set shrinkage.
DEEP. COMP	Enable or Disable the electrode compensation in EDM mode
SLOP. MODE	mode in the SLOP function
LATH.MODE	Set lathe mode
RI MODE	Set RI mode
AUTO.SCH	Search border automatically or not
AUTO SET	Set parameters of an axis automatically.
ALL CLS	Clear all data (in EEPROM), resume default setup
EXIT	Save what you have setup and exit setup.

Remarks: ***What you have changed would not been saved if you quit "SETUP" without select EXIT function (except the "AUTO SET" and "ALL CLS" functions). If you turn off the power or power outage, your setup would not work and you should set up again.***

2.1 Enter SETUP

After switching on, the DRO will automatically go through a brief self-test routine. Press Enter during this routine. The message-window will display "SETUP" when self –test is over. This indicates that you have entered "SETUP". Then press  or  to reach the option you wish to set up.

Remarks: *The*  *and*  *in this chapter refer to the arrow keys below the message window.*

2.2 Set numbers of linear scale installed

1. After entering "SETUP", press  or  until the message-window displays "SEL SYS".
2. Press Enter,

Y-window displays “1”or “2” or “3”.
“1” indicates linear scale has only been installed in X-axis.
“2” indicates that linear scales have been installed in X-axis and Y-axis.
“3” indicates that linear scales have been installed in X-axis, Y-axis and Z-axis.

3. Press [1]; Y-window displays “1”;
 Press [2], Y-window displays “2”;
 Press [3], Y-window displays “3”.
4. Press [Enter] to confirm your selection and exit;
 Press [AC] to cancel your selection and exit.

2.3 Linear scale direction

1. After you have entered “SETUP”, press [↓] or [↑] until the message-window displays “DIRECT”.
2. Press [Enter] to enter direction setup;
 X-window, Y-window and Z-window will display “0” or “1” separately.
 “0” and “1” indicate converse linear scale measurement direction.
 The message-window displays “SEL AXIS”. This indicates that the next step is to select axis.
3. Select an axes
 Press [X] to change X-axis measurement direction;
 Press [Y] to change Y-axis measurement direction;
 Press [Z] to change Z-axis measurement direction.
4. Press [Enter] to confirm your selection and exit.
 Press [AC] to cancel your selection and exit.

2.4 Linear error compensation

This option allows you to correct errors between measuring value and standard value.
Correction range: ±9.999 mm/m

$$\text{Calculating method of correcting value} = \frac{(\text{Measuring value} - \text{Standard value}) \times 1000{,}000}{\text{Standard value}}$$

For example: Measuring value 1001.000 mm
Standard value 1000.000 mm
Correcting value (1001.000-1000.000) ×1000 = 1000

Correcting value unit: μm/m.

1. After entering “SETUP”, press ↓ or ↑ until the message-window displays “LIN COMP”.
2. Press Enter,

 X-window, Y-window and Z-window displays the original liner error separately.

 Correcting value is an integer with μm as unit.

 The message-window displays “SEL AXIS”. This indicates that the next step is to select axis.
3. Selection of axes.

 Press X to select X-axis. Number on X-window flashes indicating that you can input the linear error compensation of X-axis;

 Press Y to select Y-axis. Number on Y-window flashes indicating that you can input the linear error compensation of Y-axis;

 Press Z to select Z-axis. Number on Z-window flashes indicating that you can input the linear error compensation of Z-axis.

 The message-window displays “ENTR.PPM”, indicating it is waiting for data.
4. Press numeric keys to enter numbers.

 If you input incorrect numbers, press AC to cancel it, and then input again.
5. Press Enter to confirm your selection and return to “SEL AXIS” state.
6. Press Enter to quit line error compensation setup,or set up another axis by repeating the steps 3 -5.

2.5 Select R/D mode

1. After entering “SETUP”, press ↓ or ↑ until the message-window displays “R OR D”.
2. Press Enter, X-window, Y-window and Z-windows displays “0”or ”1” separately.

 Remarks:

 *“0” indicates **R** mode, the display value equal to the actual value.*

 *“1” indicates **D** mode, the display is two double of the actual value.*

 The message window display “SEL AXIS”, it indicate that the next step is to select axis.
3. To select axis

 Press X change the R/D mode of X axis;

 Press Y, change the R/D mode of Y axis;

 Press Z, change the R/D mode of Z axis
4. Press Enter to confirm the new setup and exit the setup.

Press [AC] to cancel your selection and exit.

2.6 Z Dial

When only install linear scale on the X axis and Y axis, you should set the Z dial to emulate the Z offset value. The Z dial indicates the distance the Z axis go when run a circle.

1. After entering “SETUP”, press [▼] or [▲] until the message-window displays “Z DIAL”.
2. Press [Enter], Y-axis displays the original Z dial and the message-window displays “Z DIAL”.
3. Enter number, the number should be a positive real value;

 For example: the Z dial is 17.050mm, enter

 [1] [7] [·] [0] [5] [0] in due order.

 If incorrect number has been input, press [AC] and input again;

 If minus has been input, it’s absolute value will be used instead.
4. Press [Enter] to confirm your selection and exit Z DIAL setup.

2.7 Scale Resolution

Resolution options: 0.05μm, 0.1μm, 0.2μm, 0.5μm, 1μm, 2μm, 5μm, 10μm, 20μm, 50μm.

0 After entering “SETUP”, press [▼] or [▲] until message-window displays “RESOLUTE”;

1 Press [Enter] ,

X-window, Y-window and Z-window displays resolution of each axis separately.

The message-window displays “SEL AXIS”, indicating the next step is to select axis.

2 Axes selection

Press [X] to change linear scale resolution of X-axis. Numbers on X-window flash;

Press [Y] to change linear scale resolution of Y-axis. Numbers on Y-window flash;

Press [Z] to change linear scale resolution of Z-axis. Numbers on Z-window flash.

3 Press [▼] or [▲] to scroll through 0.05, 0.10, 0.20, 0.50,1.00, 2.00, 5.00, 10.00, 20.00, 50.00.

As the right resolution displayed, press [Enter] to confirm your selection and return to “SEL AXIS” state.

Press [AC] to cancel your selection.

5 You can select another axis to set resolution by repeating 3-4 steps or press [Enter] to exit resolution setup.

2.8 RELAY mode

1. After entering “SETUP”, press [▼] or [▲] until message-window displays “RELAY.MOD”.
2. Press [Enter], Y-window displays “0” or “1”.
3. Press [0] or [1] to convert RELAY mode.
4. Press [Enter] to confirm your selection and quit RELAY mode setup.

 Press [AC] to cancel your selection and quit RELAY mode setup.

In RELAY state:

RELAY MODE	SWITCH ON	ENTER EDM	PROCESS TO TARGET POSITION	EXIT EDM
MODE 0	OFF	OFF	ON	OFF
MODE 1	ON	ON	OFF	ON

2.9 EDM mode

1 After you have entered “SETUP”, press [▼] or [▲] until message-window displays “EDM MODE”.

2 Press [Enter], Y-axis displays “0”, “1” , “2”, ”3”, “4” or “5”.

3 Press [0], [1], [2], [3], [4], or [5] to convert EDM mode.

4 Press [Enter] to confirm your selection and quit EDM mode setup.

Press [AC] to cancel your selection and quit EDM MODE setup.

2.10 Select input mode in SDM coordinate

1. After entering “SETUP”, press [▼] or [▲] until the message-window displays “SDM DIR”;
2. Press [Enter], Y-window displays “0” or “1”.

 “0” indicates that display value is equal to input value in SDM window.

 For example: Press [5] [0] [·] [3] [0] [Enter], the display value is 50.30

"1" indicates that display value is equal to the negative of the enter value.

For example: Press [5] [0] [·] [0] [3] [Enter], the display value is –50.03.

3. Press [0] or [1] to convert data input mode.
4. Press [Enter] to confirm your selection and quit SDM DIR setup.

 Press [AC] to cancel your selection and quit SDM DIR setup.

2.11 ERROR signal display enable/disable

1. After entering "SETUP", press [▼] or [▲] until the message-window displays "ERROR";
2. Press [Enter], Y-window displays "0" or "1".

 "0" means no ERROR signal displayed if there is something wrong with linear scale or encoder (suppress the error warning), it will continue to work.

 "1" means error message will be displayed when error occurs. If it does not affect the work, the user can press [AC] ,then the display get right and the work continue.
3. Press [0] or [1] to convert;
4. Press [Enter] to confirm your selection and exit.

 Press [AC] to cancel your selection and quit ERROR setup.

2.12 Shrinkage ratio setup

1. After entering "SETUP" , press [▼] or [▲] until the message-window displays "SHRINK";
2. Press [Enter], Y-window displays the original shrinkage ratio and the message-window displays "SHRINK".
3. Enter the shrink ratio you wish to apply. The ratio is a positive real value between 0.1 to 10.

 If incorrect numbers have been entered, press [AC] and input again.
4. Press [Enter] to confirm your selection and .

Remarks: $Shrinkage\ ratio = \frac{Dimensions\ of\ the\ finished\ product}{Dimensions\ of\ the\ working\ piece}$

2.13 Deep compensation enable/disable

1. After entering “SETUP”, press ↓ or ↑ until the message-window displays “DEEP.COMP”.
2. Press Enter, Y-window will displays “0” or “1”.
 “0” indicates disable deep compensation;
 “1” indicates enable deep compensation.
3. Press 0 or 1 to convert.
4. Press Enter to confirm your selection and quit.

 Press AC to cancel your selection and quit.

2.14 Ramp process mode

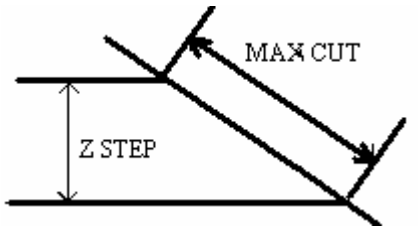
1. After you entering “SETUP”, press ↓ or ↑ until the message window displays “SLOP.COMP”;
2. Press Enter, Y-window will displays “0” or “1”.
 “0” indicates **Z_STEP** mode. Input the Z-axis Tool feed step;
 “1” indicates **MAX CUT mode.** The feed step is constant cut value.

2 Press 0 or 1 to convert.

3 Press Enter to confirm your selection and exit.

Press AC to cancel your selection and exit.

Remarks: *The definition of **MAX CUT** and **Z STEP**:*



2.15 Select lathe mode

1 After entering “SETUP”, press ↓ or ↑ until the message window displays “LATH.COMP”.

2 Press Enter, Y-window displays “0” or “1” or “2”.
 “0” indicates Lathe Mode 0 (disable Lathe function).
 “1” indicates Lathe Mode 1.

"2" indicates Lathe Mode 2.

3 Press [0] or [1] [2] to convert (*refer to 3.16*).

4 Press [Enter] to confirm your selection and exit.

Press [AC] to cancel your selection and exit.

2.16 Set up RI mode

1 After entering "SETUP", press [▼] or [▲] until the message-window displays "RI MODE".

2 Press [Enter] to enter RI setup,

X-window, Y-window and Z-window will displays the *RI mode* of linear scale separately.

The message-window displays "SEL AXIS". This indicates that the next step is to select axis.

3 Select the axes

Press [X] to change the *RI mode* of X-axis, the X-window will flashing;

Press [Y] to change the *RI mode* of Y-axis, the Y-window will flashing;

Press [Z] to change the *RI mode* of Z-axis, the Z-window will flashing.

4 Press [▼] or [▲] , then 0, 2, 4, 6, 8, 10, 12, 14 will displayed in turn. Select the RI mode you wanted and Press [Enter] to confirm, and go back to the select axis state. Press [AC] to cancel your selection and go back to the select axis state.

5 Repeat step of 3 and 4 to set up the other axis's RI mode. Or you can press [Enter] to quit the RI mode setup.

The definition of RI value:

RI is explained with a BYTE from b1 to b3.

b3	b2	b1
RI_POL	B_POL	A_POL

RI-POL RI signal polarity
B_POL B signal polarity
A_POL A signal polarity

2.17 Enable/disable search border automatically

Set up whether search border automatically or not in EDM.

1 After entering “SETUP”, press ↓ or ↑ until the message-window displays “AUTO.SCH”.
2 Press ENTER, Y-window displays “0” or “1”;
“0” indicates disable the search automatically function, “1” indicates enable it.
3 Press 0 or 1 to convert;
4 Press Enter to confirm your selection and exit.
Press AC to cancel your selection and exit.

2.18 Set up a certain axis automatically

Clear data message of a certain axis and then set data to the axis automatically.
After you have operated this function you must reset the origin of the linear scale.
This function includes the followings:
1: ABS zero;
2: INC zero;
3: All number of SDM (1000 group) coordinate is clear to zero;
4: Linear scale is installed to the axis set from X-axis at least;
5: Set the resolution to 5 μm;
6: The shrinkage is set to 1.000.
Operating steps:
1 If entering “SETUP”, Press ↓ or ↑ until the message-window displays “AUTO SET”.
2 Press Enter, the message window will show “SEL SYS”.
3 Select an axis:
Press X to set up X-axis automatically and press Y to set up Y-axis, press Z to set up Z-axis . Then the message-window will display “WAITING”, it’s setting the system automatically now. It needs about 15 seconds. After finish the message-window will display “SET OK” 2 seconds. And then show you “SEL SYS”, you can set another axis now.
4 Press AC to exit auto setup.

2.19 All clears

Description : Clear all data except the linear compensation and the numbers the linear install. And the system will set parameters automatically.
After all clears you must set the origin of linear scale.
The original data can’t be resumed after all clear.

Operating steps:

1 After entering “SETUP”, press  or  until message-window displays “ALL CLS”.

2 Press Enter and the message-window displays “CLS ALL” and flash to remind the operator if he is sure to proceed.
At this moment there are two selections:

A. Press AC to quit “ALL CLS”;

B. Press Enter to proceed “ALL CLS”.

3 Press Enter to clear all, the message-window displays “WAITING”, indicating “ALL CLS” is processing. When it finishes clear, the message-window will display “CLS OK” for about two seconds, and then exit.

The value of parameters after all clear (factory default):

0 The counting direction of the linear scale is “0”.
1 The mode of R/D is R.
2 Z DIAL =0.
3 RESOLUTE=5μ.
4 The EDM mode is manual detect mode (Mode 0).
5 The input mode is “0” in SDM state, and the display value equal to the input value.
6 Disable deep compensation, lathe mode is mode 0.
7 RELAY mode is 0, Ramp process mode.

2.20 Exit SETUP

1 After entering “SETUP”, press  or  until message-window displays “EXIT”.

2 Press Enter to exit “SETUP”.

Remarks: *The modified data is valid only after quit “SETUP” by “EXIT” (except “AUTO SET” and “ALL CLS”). If you switch off in the process of setting up or power outage, the change doesn’t work and you should set up again.*

3 BASIC OPERATING

3.1 Switch ON

Function: When you Switch on POWER, the digital read-out (DRO) will automatically go through a brief of self-test routine. If don't enter "SETUP", it will enter normal monitor status when self-test is over. It can memorize the followings when it works normally.

A: The position when last power off;
B: ABS/INC/SDM mode;
C: The shrink is set or not
D: Metric/imperial mode.

If linear scale is moved before the power switched on, you must search the origin of the linear scale again.

Nouns definition:

Normal monitor state:

The state DRO automatically enter after you switch on the or quit "SETUP". In normal monitor state, X-window, Y-window or Z-window displays the value of X-axis, Y-axis or Z-axis separately. The message-window displays "ABS" or "INC" or "SDM ***" (indicates the NUM of SDM coordinate, which with an range 000~999). When you switch among ABS/INC/SDM, MM/INCH, or shrinkage/un-shrink, you will not leave this state. When you enter CALCULATOR function, input data to X(or Y or Z) axis, function of searching the origin (RI)of the linear scale or special function (PCD, PLD, ARC, RAMP and EDM function), DRO is not in the normal monitor state.***

3.2 Clear to ZERO

Function: When the DRO is in the *normal monitor state*, it zeros the value of axes.

Remarks:

1. ***When the DRO is in the other states (for example, in the state of calculate function or in special function), you can't clear the axis. And you should return to the normal monitor state;***
2. ***You can clear in SDM/ABS/INC states;***
3. ***When you clear in ABS coordinate, you clear the INC display value simultaneously.***
 When you clear in INC mode, there is no effect to ABS and SDM display value.

Operating steps:

1 Return to *normal monitor state*.

2 Press X_0 to zero X-axis;

Press Y_0 to zero Y-axis;

Press Z_0 to zero Z-axis.

3.3 Preset Data

Function: Set up the display value of the current position in *normal monitor state*.

Remarks:

1 When the DRO is in other states(e.g. calculator function or special functions), you can't preset data. In this case, you should first return to *normal monitor state.*

2 You can preset data in *SDM/ABS/INC* state.

3 In SDM state, input mode in SDM coordinate is "0" indicates that display value is equal to enter value; input mode in SDM coordinate "1" indicates that display value is equal to the negative of enter value. (Please refer to 2.10).

4 Input data range: the minimum value to the maximum value could displayed on an axis window.

Operating steps: To enter a value of –125.457 in X-axis:

1 Return to *normal monitor state.*

2 Press [X], X-window displays "0", waiting for entering data.

3 Press [1] [2] [5] [·] [4] [5] [7] [+/–] in due order.

If it is in SDM state and SDM input mode is "1", you needn't input [+/–], Otherwise, you must enter [+/–].

If you input incorrect numbers, press [AC] and then input again.

4 Press [Enter] to confirm your input value.

5 Input data in Y-axis and Z-axis in the same way.

3.4 Imperial/Metric conversion

Function: Switch display dimension modes between "mm" and "inch".

Remarks: *You can't convert when the digital read-out is in other states (e.g. calculator function or special function). In this case, you must first return to normal monitor state.*

Operating steps:

1 Return to *normal monitor state*;

2 Press [IN/MM] to convert.

3.5 Search the center of work-piece

Function: Divide the current display value by 2. With this function, you can set origin at the center of the work-piece.

Example: Set up the central point of X-axis for the work piece.

Operating steps:

1. Return to normal monitor state.
2. Locate to your first position (one edge of your work-piece) and press X_0 to zero X-axis.
3. Locate to the second position (the other edge of the work-piece) and press $\frac{1}{2}$ to locate the central point. The message-window displays “1/2 AXIS”.
4. Press X, you have set up the central find of X-axis.
5. Move until the display value of X-axis is “0”and it is the central of the work-piece.

3.6 Transform in shrink state and un-shrink state

Function: After setting up shrinkage ratio, you can process the mould tools according to dimensions of the finished products without calculating dimensions of materiel.

Display dimension = product actual dimension × shrink ratio (Please refer to 2.12).

Operating steps:

1 Return to *normal monitor state*.

2 Press SHK and don’t release until the Y-window display displays the shrinkage you wish to apply and the message-window displays “SURE AGN”. This indicates that you need to confirm once again if you want to enter shrink state.

3 Press Enter to enter shrink state. (Press any other key to return to un-shrink state)

4 In shrink state, DRO will transform to un-shrink state when SHK is pressed. (Shrink LED will be off)

Remarks:

1 *Press* SHK *and don’t release until you press* Enter *simultaneously to enter SHRINK state.*

2 *With this function, you can look up the shrink ratio which set by SETUP (refer to 2.12):*

Press SHK*, Y-window displays shrink ratio, then press any key to return to the original state.*

3 *In shrink state, shrink LED will flash.*

3.7 Switch to ABS coordinate

Function: DRO provides three coordinates: ABS, INC and a number of 1000 sets of SDM (0 ~ 999).

1. Origin of the work-piece is set at the origin of ABS coordinate;
2. The relative distance value of the SDM and ABS retains when you change ABS origin;
3. If ABS coordinate is zeroed, the INC coordinate of this point is zeroed accordingly.
 If INC coordinate is zeroed, ABS coordinate retains.

Operating steps:

1 Return to *normal monitor state*.

2 **A.** If the message-window displays “ABS”, this indicates that you have entered ABS state.

B. If the message-window displays “INC”, this indicates that it is in INC state.

Press INC/ABS, then the message-window displays “ABS”. This indicates there is in ABS state.

C. If the message-window displays “SDM”, this indicates that it is in SDM state.

In this case, you should first press INC/ABS or SDM to enter “ABS” or “INC” state.

If you have entered INC state, then press INC/ABS and you will switch to “ABS” state.

3.8 Switch to INC state

Function: Please refer to 3.7.

Operating steps:

1. Return to *normal monitor state*;
2. **A**. If the message-window displays “INC”, this indicates that it is inINC state.

B. If the message-window displays “ABS”, this indicates it is in ABS status;

Press INC/ABS and the message window will display “INC”. This indicates that it is in INC state.

C. If the message-window displays “SDM”, this indicates that it is in SDM state.

You should first press INC/ABS or SDM to return to “ABS” or “INC” state.

If you are in ABS state, then press INC/ABS to switch to “INC” state.

3.9 Switch to SDM state

Function: Please refer to 3.7.

Operating steps:

1 Return to *normal monitor state*.

2 **A**. If the message-window displays “SDM”, this indicates that it is in SDM state.

B. If the message-window displays “ABS” or “INC”, this indicates that it is in ABS or INC state.

Press SDM until the message-window displays “SDM ***”, *** indicates the SDM coordinate NUM last time.

3.10 Set SDM program number

Function: Enter new SDM coordinate NUM in SDM state

Operating steps:

1 Enter SDM state.

2 Press [2ndF], message-window display flashes, this indicates you can at present input new coordinate NUM.

3 Enter coordinate NUM:

For example: Press [6] [6] [6]

4 Exit

Press [2ndF], SDM display will stop flashing and the program numbers change to 666.

3.11 Increase SDM program number

Function: In SDM state, press [▼] (next) and SDM program number will increase 1.

For example: The original coordinate NUM is 777, and the message-window displays “SDM 777”. Press [▼], The message-window will display “SDM 778” and it will update the display value of X-axis, Y-axis, Z-axis according to the origin of 778th SDM coordinate.

When the coordinate NUM is 999, press [▼] will cause the coordinate NUM to 000.

3.12 Decrease SDM group number

Function: In SDM state, press [▲] and SDM program number will decrease 1.

For example: The original coordinate NUM is 777, and the message-window displays “SDM 777”. Press [▲], the message-window will display “776” and it will update the display value of X-axis, Y-axis, Z-axis according to the origin of 776th SDM coordinate.

When the coordinate NUM is 000, press [▲] will cause the coordinate NUM to 999.

3.13 SDM all clear

Function: Clear the origin of all 0-999 SDM coordinate. After clearing, the display value in SDM is equal to the display value in ABS coordinate.

Operating steps:

1 Return to *normal monitor state*.

2 Press [INC/ABS] and [AC] simultaneously for 2 seconds, the message-window will display “CLS SDM”. This indicates that SDM CLEAR is going. The message-window will display “CLS OK” when clearing finished after 10 seconds and return to the previous state.

3.14 Search linear scale origin (RI)

Function: Search the origin of the linear scale and store the distance from the position when you switch off to the origin of the linear scale. If the linear scale moves before the power is on, you should also search the origin of the linear scale again.

Operating steps:

1 Switch to ABS coordinate. (Please refer to 3.7)

2 Press [RI], then the message-window displays “SEL AXIS”.

3 Select the axis on which you need to search the origin.

4 Move the linear scale to search the origin. After the origin has been found, the alarm will sound, the window stops flashing. DRO adjust the display value according to the origin and quit this setup to return to the *normal monitor state*.

If you want to cancel in the process of searching, you can press [AC] during the search process.

Example:

Press [Z] if you want to search RI on Z-axis. The message-window displays “FD. Z REF”, Z window flashes. Move the linear scale on Z axis until the buzzer sound.

3.15 Clear error information of the linear scale

When ERROR signal display is enable, the message-window will display “E1” if the signal of **A** phase and **B** phase of the linear scale changed at the same time; the message-window will display “E2” if the linear scale run too fast; the relative window will display “E3” if the two conditions occur simultaneously,. When error signal appeared, the distance the linear scale record is incorrect. So you need to search the origin of linear scale again. If you thought that it doesn’t affect your work, press [AC] to clear error information and continue your work.

3.16 Lathe function

Function:

(1) Lathe mode 0: normal display (The lathe function is disable);

(2) Lathe mode 1: X-Window value =X-axis normal value + Y-axis normal value;

(3) Lathe mode 2: X-Window value =X-axis normal value + Z-axis normal value;

Operating steps:

1. In SETUP set LATH.MODE to 1 (Please refer to 2.14).
2. Press [LATHE] key In *normal monitor state* to enter Lathe mode in which the lamp of LATHE is on.
3. In lathe state, press [LATHE] key to exit the Lathe mode, then the lamp of LATHE turns off.

4. SPECIAL FUNCTIONS

Remarks:

1  *or*  *of this chapter refer to*  *or*  *below the message-window.*

4.1 PCD process (Pitch Circle Diameter)

Function: WE6800 series DROs provide the operator with the function to find the position of a series of points around the circumference of a circle. All the operator need to do is to enter the following parameters:

RADIUS:	Radius
ST. ANGLE:	Start angle
END. ANGLE:	End angle
HOLE NUM:	Number of hole
DIRECT:	Angle direction

After the parameter entered, it will automatically calculate the position of each hole. Press  or  to select hole number and move the machine tool until X-window displays “0” and Y-window displays “0” and it is the position of the hole.

For example:

Radius (RADIUS):	100
Start angle (ST. ANGLE)	30°
End angle (END. ANGLE)	150°
Number of hole (HOLE NUM)	5
Angle direction (DIRECT)	0

Remarks: “0” indicates that it is counterclockwise from ST. ANGLE to END. ANGLE.
“1” indicates that it is clockwise from ST. ANGLE to END. ANGLE.

Operating steps:

1 Transform the display unit to millimeter (Please refer to 3.4).
Move the machine until the top point of the tool fixes on the center of the circle. X-axis clears, Y-axis clears (please refer to 3.2).

2 Press  to enter PCD function. If you have enter parameter, press [Enter] to enter procession.

3 Enter radius,
Y-window displays the original radius, the message-window displays “RADIUS”.
Press [1] [0] [0] [Enter] in due order.

Remarks:

1. I*f incorrect parameter has been entered and you haven’t press* [Enter]*, press* [AC] *to clear*

directly and input again; if you have pressed [Enter]*, and begin to set up the next parameter, you should press* [▲] *to return to RADIUS set and input again. Treat with other error parameters in the same way.*

2. *The radius couldn't be 0;*

4 Input ST. ANG

The message-window displays "ST. ANG", Y-window displays the original start angle.

Press [3] [0] [Enter] in due order.

5 Input END.ANG

The message-window displays "END.ANG", Y-window displays the original end angle.

Press [1] [5] [0] [Enter] in due order.

6 Set Number of Holes

The message-window displays "HOLE NUM"; Y-window displays number of holes.

Press [5] [Enter] in due order.

7 Select direction

The message-window displays "DIRECT"; Y-window displays the original direction.

Press [0] [Enter] in due order to input the angle direction.

8 The message-window displays "HOLE 1";

Move the machine until X-window and Y-window display "0.000" and begin to punch.

9 Press [▼] or [▲] to change among the holes.

10 Press [◯] to return to *normal monitor status*.

Remark: *In the course of PCD process, press* [RTN] *and leave PCD function temporarily to return to the normal Monitor state of X,Y or Z-axis in order to check the position the DRO has calculated. And then press* [RTN] *again to return to PCD function.*

4.2 PLD process (Pitch Line Divided)

Function: WE6800 series DRO provide PLD function. All of the operator need to do is to enter the following parameters:

LINE DIS	Pitch line distance
LINE ANG	pitch line angle
HOLE NUM	number of hole

The DRO will automatically calculate the position of holes after you have input the parameter. Press [▼] or [▲] to select hole number and move the machine until the display value of X-window and Y-window is "0" and it is the position of the hole.

Example:

LINE DIS	500.6
LINE ANG	60°
HOLE NUM	5

Operating steps:

1 Transform the display unit to millimeter (Please refer to 3.4).
Move the machine until the top point of the tool fixes to the start point, then clear the X-axis and the Y-axis. (Please refer to 3.2)

2 Press [PLD] to enter PLD function. If parameters had been input, press [Enter] to enter processing state directly.

3 Set LINE DIS (Line length)
Y- window displays the original line length. The message-window displays “LINE DIS”.
Press [5] [0] [0] [·] [6] [Enter] in due order.

4 Set LINE ANG (Line angle)
Y-window displays the original line angle; The message-window displays “LINE ANG”.
Press [6] [0] [Enter] in due order.

5 Set HOLE NUM (number of holes)
Y-window displays hole numbers ; The message-window displays “HOLE NUM”.
Press [5] [Enter] in due order. Then begin to process.

6 The message-window displays “HOLE 1”;
Move the machine until the display value of X-window and Y-window is “0.000”. Then you can drill a hole at this point.

7 Press [↓] or [↑] to convert among holes.

8 Press [PLD] to return to normal monitor state.

Remark: *In the course of PLD process, the operator can press* [RTN] *to leave this function temporarily and return to normal display of X, Y or Z-axes in order to check the position which the DRO calculated. Then press* [RTN] *once more to return to PLD function.*

4.3 ARC process

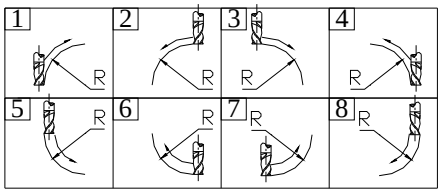
Function:

1. There are 8 type ARC processing modes as illustrated as the figure on the following page.
2. When you use a flatbottomed tool for ARC process, set the tool diameter to 0.
3. When you select tool compensation direction to process YX and XZ planes, the tool is in the same plane with the process plane. There is only one type of tool compensation direction for each ARC model. When you process in XY plane, the tool is vertical to process plane. There are internal ARC process and external ARC process for each type. So there are two tool compensation directions:

T+TOOL and T-TOOL.

The following figure shows you the eight types of preset R process mode:

Type of ARC(Type 1-8)



Direction of Tools Compensation (for XY pane)

Outer ARC (T+TOOL) Figure	
Inner ARC (T-TOOL) Figure	

Enter the following data for ARC processing:

	TYPE 1-8	Type of ARC
*	T+ TOOL / T-TOOL	Select between T+ TOOL / T-TOOL (particularly for XY plane)
	RADIUS	The radius of Arc that will be processed.
	TOOL DIA	Tool diameter
*	MAX CUT	Feed Step (special for XY plane)
**	Z STEP	Feed Step (special for YZ, XZ plane)

Example 1:

SIMR	XY
TYPE	2
T+TOOL	
RADIUS	200mm
TOOL DIA	5mm
Z STEP	1mm
SHRINK	shrinkage isn't taken into consideration.

Operating steps:

1. In *normal monitor state*, select the mm conversion. The shrink lamp doesn't light up.
2. Enter ARC processing state:

 Press  to enter ARC processing state.

 If parameters have been entered, press [Enter] to enter processing state directly.
3. Select processing plane;

 Press [Z], [Enter] to select ZX plane and enter state of selecting processing mode.

Remarks: [X] indicates XY plane;

[Y] indicates YZ plane;

[Z] indicates ZX plane.

You can press [↓] or [↑] near [SDM] to switch among XY plane, YZ plane or ZX plane.

4. Select processing mode;

The message-window displays “TYPE-8”; Y-window displays the previous processing mode;

Press [2], [Enter] to enter Mode 2 and enter the state to select T+TOOL or T-TOOL;

5. Select T+TOOL mode

Press [+], [Enter] to select the T+TOOL mode and then go to set arc radius value.

Remarks : [+] indicates T+TOOL

[−] indicates T-TOOL

6. Set ARC radius

The message-window displays “RADIUS”, Y-window displays the previous set radius value;

Press [2] [0] [0] [Enter] in due order.

7 Set Tool diameter

The message-window displays “TOOL DIA”; Y-window displays the previous set tool diameter;

Press [5] [Enter] in due order.

8 Set Z-axis Feed STEP

The message-window displays “Z STEP”; Y-window displays the previous set step value.

Press [1] [Enter] .

Complete the ARC parameter setting and then go to execute ARC process (Step 9) automatically.

9 Arc process

The message-window displays “POIN 1”. Process until the display value of X-axis and Y-axis is “0”.

You have finish processing the first point; Press [↓] to transform to the second point and repeat the above steps. Press [↓] or [↑] to select the processing points.

The coordinate that X-window and Y-window display is the coordinate of the top point of the tool.

10 When you finish processing, press [◺] to exit.

Remark:

In the ARC processing, the operator can press [RTN] *to leave this function temporarily to return to normal display of X,Y or Z-axis in order to check the position the DRO has calculated.*

Press [RTN] *again to return to ARC function.*

If Z-axis hasn't been installed, press ↓ *or* ↑ *to emulate the Z-axis.*

S*teps:*

1 Set up Z dial in SETUP.

2 Before you process, you should first locate the machine to the Z-axis of the R start point and clear the value on Z-axis's to 0.

3 In the course of processing, the message-window displays the emulated height of Z-axis. It is the height of Z-axis of the current position when the operator stops processing.
If you process XY plane, X-window displays the position of X-axis. You complete process at X direction when the display value of X-axis is "0". The first two digits of the number displayed on Y-window is the number of the dial circles, the latter five digits is the number of graduation. It means that you only need to process to the graduation of the circle as regards to the current processing point.
If you process YZ plane, Y-window displays the position of Y-axis. You needn't process at Y direction when the display value of Y-axis is "0"; The first two digits of the number displayed on X-window is the number of the dial circles, the latter five digits is the number of graduation. It means that you only need to process to this position as regards to the current process point.

4.4 RAMP process

Function introduction: WE6800 series provide function of RAMP. All the operator need to input is as follows:

INCL ANG ramp angle

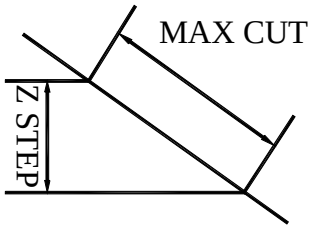
MAX CUT the ramp length each time process.

After data has been input, the DRO will automatically calculate the position of each ramp points. Press ↓ or ↑ to select sequence number of process point and process with the tool until the display value of X and Y axes of the plane is "0" and it is the position of the point.

Example:

1. PLANE YZ
2. INCL ANG 240°
3. MAX CUT 1.2

Remarks: The definition of Z STEP and MAX CUT.



Operating steps:

1. Select the display unit to mm. (please refer to 3.4)
Set SLOP.MODE to 1 in SETUP (refer 2.14). If 3rd parameter is "Z STEP", set SLOP.MODE to 0.
Move the machine to the central point of the circle until X axis clear and Y-axis clear.(Refer to 3.2)

2. Press  to enter RAMP processing function.

 Press Enter to start RAMP process if the parameters are input already.

3. Select the processing plane:

 Press Z, Enter and select ZX plane to enter processing selecting mode.

 Remarks: X indicates XY plane;

 Y indicates YZ plane;

 Z indicates ZX plane.

 You can also press  or  near SDM to switch among XY plane, YZ plane or ZX plane.

4. Enter the ramp angle

 The message-window displays “INCL ANG”; Y-axis displays the original incline angle.

 Press 2 4 0 Enter in due order.

5. Set incline length of each time

 The message-window displays “MAX CUT”; Y-axis displays the original incline length.

 Press 1 · 2 Enter in due order.

6. Procession

 The message-window displays “POIN 1”.

 Process until Y axis and Z axis display 0, then press  and proceed to the next step.

7. Press  or  to select the points, and process as step 6.

8. Press  again to exit BVEL process (return to *normal monitor state*).

Remark:

If Z-axis hasn’t been installed, press  *or*  *to emulate the Z-axis.*

Press  *to emulated Z-axis to move to the next position or press*  *to move the previous position.*

Steps:

1 Set Z DIAL in SETUP;

2. Before processing, set the machine to the Z-axis of the RAMP start point and clear Z-axis position to “0.000”;

3. In the course of processing, the message-window displays the emulated height of Z-axis. It is the height of Z-axis of the current position if the operator stops processing;

If you process XY plane, X-axis displays the position of X-axis. If X-axis displays “0”, this indicates that you have complete processing at X direction; The left two digits of the numbers displayed in Y-axis is the numbers of the circles, the latter five digits is the numbers of *graduation.* This indicates that you process to *this position as regards to the current point;*

If you process YZ plane, Y-axis displays the position of Y-axis. If Y-axis displays “0”, this indicates that

you needn't process at Y direction; The front two digits of the numbers displayed in X-axis is the numbers of the circles, the latter five digits is the numbers of graduation.. This indicates that you process to this position as regards to the current point;

In the course of RAMP processing, by pressing [RTN] *the operator can temporarily leave this function to display the normal value of the X, Y, Z axes which in order to check the position the DRO has calculated.*

Repress [RTN] *to return to RAMP function.*

4.5 Set up EDM DEEP, EDM HOME

Function: To control EDM processing depth.

Example: Set depth to 156.125mm

EDM HOME to 30.05mm

(EDM HOME value is the height the electrode exit from the process plane when EDM finish processing. Only the exit distance exceed this height the relay can be reset.)

Operating steps:

1 In *normal monitor state*, switch to metric system in MM/IN state.

2 Press [DEEP SET],

Y-axis displays the previous set depth; The message-window displays "EDM DEEP".

3 Press [1] [5] [6] [·] [1] [2] [5] [Enter] in due order.

4 Enter EDM HOME

Y-axis displays EDM HOME value. The message-window displays "EDM HOME".

5 Press [3] [0] [·] [0] [5] [Enter] in due order.

6 Press [DEEP SET] to quit EDM DEEP setup.

4.6 Electrode compensation setting

Function: When processing depth with electric discharge machine(EDM),the electrode of the EDM will wear out. The amount of electrode compensation equal the length wear out in the each processing.

Example: Electrode compensation amount equal 1.25mm.

Operating steps:

1 In *normal monitor state*, switch the display unit to mm.

2 Set up DEEP.COM to "1" in "SETUP"(refer 2.13).

3 Press [E.COMP],

Y-axis displays the previous set electrode compensation value.

The message-window displays "EDM COMP".

4 Press [1] [·] [2] [5] [Enter] in due order.

5 Press [E.COMP] to quit from the setup and return to *normal monitor state*.

4.7 EDM process

EDM has 6 processing modes: manual and automatic modes.

MODE0	Manual mode 1
MODE1	Automatic mode 1
MODE2	Manual mode 2
MODE3	Manual mode 3
MODE4	Automatic mode 2
MODE5	Automatic mode 3

You can select one in SETUP. (Please refer to 2.9)

Remark: *Difference between diversified modes:*

EDM MODE	SEARCH BORDER AND CLEAR AUTOMATICALLY	PORCESS DIRECTION WHEN THE DEPTH IS MINUS	EXIT AFTER THE FIRST PROCESSION	THE PLUS DIRECTION OF Z-AXIS
0	NO	DOWN	EXIT	DOWN
1	YES	DEPTH CAN'T BE MINUS	DON'T EXIT	DOWN
2	NO	DOWN	DON'T EXIT	DOWN
3	NO	UP	EXIT	DOWN
4	YES	UP	DON'T EXIT	UP
5	YES	DEPTH CAN'T BE PLUS	DON'T EXIT	UP

MODE 0 EXAMPLE:

1 With normal manual process, SHRINKAGE isn't taken into consideration.
2 The EDM DEEP is 20mm and the EDM HOME is 5 mm.
3 Electrode compensation is 0.01 mm.

Operating steps:

1 Set EDM MODE to 0 when you enter SETUP after switching on (Please refer to 2.9).
DEEP.COM was set to 1, means there is Electrode compensate.
2 Shrinkage isn't taken into consideration (Please refer to 3.6).
3 Transform the display unit to mm(Please refer to 3.4).
4 Set EDM DEEP to 20 mm, EDM HOME to 5 mm(Please refer to 4.5).
5 Set Electrode compensation to 0.01 mm(Please refer to 4.6).
6 Move the electrode header, until it touch the process plane, then press [Z_0] to clear Z-axis.
7 Enter EDM function.

Press [EDM], message-window displays "EDM RUN".
Z-window displays the current position of the electrode; X-window displays the EDM DEEP +

EDM COMP; Y-window displays the maximum depth of the previous processing.

8 The alarm will sound when Z-window value = EDM DEEP + EDM COMP. Then message-window displays “BACKWARD”, the operator stops processing and the electrode header quit;
When withdrawing the electrode, Z-window displays the current position of the electrode; X-window displays the EDM DEEP + EDM COMP; Y-window displays the maximum depth processed.
If the electrode does not exit in 25 seconds, DRO exit the process automatically.
If the electrode exit distance exceeds EDM HOME value, quit this process.

9 When the electrode is withdrawn from the holes, the alarm still sounds, DRO quit the process. After adjust X-axis and Y-axis of the electrode, Press EDM, repeat step 7~step9 to process next hole.
The light of EDM is flash during process if the depth compensate is enable.
During EDM process, you can press EDM to quit the procession.

Remark: *In the course of EDM process, by pressing* RTN *the DRO can temporarily quit EDM function and return to normal XYZ display in order to check the position the DRO calculates. Repress* RTN *to return to EDM function.*

MODE 1 EXAMPLE:

1 With normal manual process, SHRINKAGE is taken into consideration.
2 The EDM DEEP is 100 mm and EDM HOME is 30 mm.
3 Electrode compensation is 0.01 inch.
4 EDM COMP is 0.5 mm.
5 The Z-axis direction is down.

Operating steps:

1 Set EDM MODE to 1 when you enter SETUP after switching on (Please refer to 2.9).
DEEP.COM was set to 1 which means the EDM COMP is enabled.
2 Transform to shrinkage state (Please refer to 3.6).
3 Set the display unit to mm (Please refer to 3.4).
4 Set EDM DEEP to 100 mm, EDM HOME to 30 mm (Please refer to 4.5).
5 Set EDM COMP to 0.5m (Please refer to 4.6).
6 Enter EDM function:
Press EDM, the message-window display “SCH BD”, Z-window display the current position of the electrode; X-window displays the EDM DEEP + EDM COMP; Y-window displays the maximum depth of the previous procession.
7 Search border and clear:
Move the electrode header until it touching the process plane, Z axis is cleared automatically, and the procession begin. You can press Z_0 to clear Z-axis also (if you had set “AUTO SCH” 0, you have to clear Z-axis manually by pressing Z_0).
8 Z-window display the current position of the electrode; X-window displays the EDM DEEP + EDM COMP; Y-window displays the maximum depth processed; Message-window displays “EDM RUN”.

9 The alarm will sound when Z-window value = EDM DEEP + EDM COMP. Then the message-window displays “BACKWARD”, the procession stop and the electrode header quit.
When withdrawing the electrode, Z-window displays the current position of the electrode; X-window displays the EDM DEEP + EDM COMP; Y-window displays the maximum depth processed.
If the electrode does not exit in 25 seconds, exit the process.
If the electrode exit distance exceeds EDM HOME value, exit this process.

10 When the electrode is withdrawn a distance equal EDM HOME from the processing panel, you can process another hole by repeat steps 7~9.

11 Press EDM to exit the procession.

MODE 2 EXAMPLE:

1 Automatic process, shrinkage isn’t taken into consideration;
2 EDM depth is 100mm;
3 Electrode compensation is 0.5mm;
4 The EDM HOME is 3mm when withdrawing the electrode.

Operating steps:

1 After entering SETUP, set EDM MODE to 1 (Please refer to 2.9).
Set DEEP.COM to 1 (If the previous setting is mode 2, you needn’t set up).
2 Shrinkage isn’t taken into consideration (Please refer to 3.6).
3 Select mm as the display unit (Please refer to 3.4).
4 EDM DEEP is 12mm (Please refer to 4.5).
5 EDM COMP is 0.01mm (Please refer to 4.6).
6 Move the electrode until it touches the processing panel. Press Z_0 to clear the Z-axis.
7 Enter EDM function.

Press EDM, Z-window displays the current position of the electrode; X-window displays EDM DEEP + EDM COMP, Y-window displays the maximum depth processed. Message window “EDM RUN”.

8 When Z-axis value = EDM DEEP + EDM COMP, the buzzer sound continuously, message-window display “BACKWARD”, the procession stop and the electrode withdraw.
When the electrode exit, Z-window displays the current position of the tool, X-window displays the EDM DEEP + EDM COMP, Y-window displays the maximum depth processed.

10 After the electrode exited, adjust the X-axis and Y-axis, and then press EDM to process another hole.

Remark: *A pressing on EDM when the tool down can cause exit from procession.*

MODE 3 AND MODE 4:

Mode 3 procession has the same steps as mode 0 and mode 4 procession has the same steps as mode 1, the difference between mode 3 and mode 0, mode 4 and mode 1 is the processing direction when the EDM DEEP is minus (refer the list on 4.7).

MODE 5 EXAMPLE (the plus direction of Z-axis is up, and the depth is minus):

1 Automatic process, shrinkage is taken into consideration.
2 EDM depth is 100mm.
3 Electrode compensation is 0.5mm.
4 The EDM HOME is 30mm.
5 The plus direction of Z-axis is up.

Operating steps:

1 After entering SETUP, set EDM MODE to 5 (Please refer to 2.9).
Set DEEP.COM to 1 (If the previous setting is mode 2, you needn't set up).
2 Transform to shrinkage state (Please refer to 3.6).
3 Select mm as the display unit (Please refer to 3.4).
4 EDM DEEP is -100mm, EDM HOME is 30mm(Please refer to 4.5).
5 EDM COMP is 0.5mm (Please refer to 4.6).
6 Enter EDM function:
Press EDM, message-window display "SCH BD",
Z-window displays the current position of the electrode; X-window displays EDM DEEP + EDM COMP, Y-window displays the maximum depth processed.
7 Search border and clear Z-axis:
Move the electrode until it touches the processing panel, then Z-axis is clear automatically and the procession begin. You can also press Z_0 to clear the Z-axis (if you had set "AUTO SCH" 0, you have to clear Z-axis manually by pressing Z_0).
8 Z-window displays the current position of the electrode; X-window displays EDM DEEP + EDM COMP, Y-window displays the maximum depth processed. Message window "EDM RUN".
9 When Z-axis value = EDM DEEP + EDM COMP, the buzzer sound continuously, message-window display "BACKWARD", the procession stop and the electrode withdraw.
When the electrode exit, Z-window displays the current position of the electrode, X-window displays the EDM DEEP + EDM COMP, Y-window displays the maximum depth processed.
10 When the electrode withdraw a distance equal EDM HOME from processing panel , you can repeat steps 7~9 to process another hole.
11 Press EDM to exit procession after precession complete.

4.8 Auto Edge Detect

Function: ① search border automatically; ② measure dimension of work-piece; ③ search the center of work-piece.

Remark: *Only the WE6800 series DROs with EDGE DETECTOR have this special function.*

Example:

1 Dimension (Radius) of EDGE DETECTOR = 5 mm.

2 Work-piece dimension on X axis = 65 mm.

3 Measure by using the linear scale installed at X-axis.

Operating Steps:

1 In the *normal monitor state*, select mm as display unit.

2 Press [RTN] to entry the "Auto Edge Detect" function.

Message-window displays "SEL AXIS", the absolute value of Y-window value is the radius of edge detector. The sign is the sign of the value displayed when detector touches the first edge (The last input value).

3 Input the radius and sign of detector.

Press [5] [+/-] [Enter], Y-window display "-5.000".

Remark: *If the last value display on Y-window is same with we want to set, skip this step.*

4 Select the axis.

Press [X] to select x-axis in this example. The X-window displays "0.000" and flashes, wait for detecting edge. Y-window, and Z-window display the current coordinate value.

Press [Y] to select Y-axis, and press [Z] to select Z-axis as the same.

5 Move the EDGE DETECTOR to touch the first edge, then the X-window will shown the position of the detector with "-5.000". The displayed value in X-axis is measure value. You can touch the edge many times.

6 Move the EDGE DETECTOR to touch another edge. The X-window will show the length of the work-piece with "65.000".

7 Press [1/2] to exit this function. Moving the EDGE DETECTOR until the X-window displays "0.000", which means that this position is the center of the work-piece at the X-axis direction.

Remark: *1 In the " Edge Detect" function, Press [RTN] will exit this function.*

2 If you detect edge only, you needn't do step 6 and step 7.

3 If do not find the center point, you needn't do step 7.

5. Calculator function

5.1 Enter calculator function

Press the [Cal] to enter calculator function in *normal monitor state*.
In calculator modem, LED of Cal is ON.

5.2 Calculating example

Example 1: 123 + 76 ×58 – 892 / 63

[1][2][3][+][7][6][×][5][8][−][8][9][2][÷][6][3][=]

Example 2: 358 + 456 * $\sin^{-1}$ (-0.5)

[3][5][8][+][4][5][6][×][0][·][5][+/−][2ndF][-1 SIN][=]

Remarks:

1. *If incorrect number has been input, press* [AC] *and input again.*
2. *Errors would occur while calculating incorrectly, such as "0" is used as divisor or proceeding arcsine or arccosine when absolute value is more than 1. In this case, the message-window will display "ERR…".*

 You can cancel this error message by pressing [AC] *and input again.*
3. *The absolute value of data input and calculated result should be in the range of 0.000001 to 9999999, or it can't be display.*

5.3 Transfer the calculating results to selected axis

After finishing a calculation, you can press [X0] to transfer the calculating result to X-axis, and press [Y0] to transfer the calculating result to Y-axis, press [Z0] to transfer the calculating result to Z-axis.

Remarks: *Value over the scope of display couldn't be transferred.*

5.4 Transfer the current display value of X-axis, Y-axis and Z-axis to the calculator

Press [X], the display value of X-axis is transferred to calculator;

Press [Y], the display value of Y-axis is transferred to calculator;

Press [Z], the display value of Z-axis is transferred to calculator.

5.5 Exit calculator function

Press [Cal] to exit calculator function and return to n*ormal monitor state*.

6 Troubleshooting

Symptom	Cause	Remedy
1. Nothing happens when the DRO is switched on.	1. The DRO is not connected to power line properly. 2. The power lead is damaged. 3. The fuse is false.	1. Ensure that the Power connect properly. 2. Replace the damaged Power cord. 3. If fail, change fuse by the 250VAC/1A lag type fuse.
2. After self test LED on, all LED gone off.	1 Power is too low 2 The internal connector of power lead is not connect properly	Check internal Connector of DC 5.0V power and clean it.
3. Err 1	1. Traveling Speed too fast 2. GROUND not good	1. Slow the speed (the max aped: 1m/sec @1u) 2. Connect the Ground properly
4. Err 2	1. Change the phase of A and B signal at same time 2. Scale is malfunction.	1. Connect the Ground properly 2. Check scale connect is good 3. Swap the scale connector to check the problem is either scale or DRO.
5. DRO work properly, but measurements are inaccurate	1. Shrink mode is set. 2. Set resolution incorrect. 3. R/D mode is set. 4. Compensation value set incorrect. 5. EDM compensation value is set. 6. Tool compensation is set. 7. Machine problem	1. Check the parameter and chose the correct mode. 2. Check the machine's backlash effect, ABBE effect etc.

Remark: *If you can't fix your problem, contact your local dealer.*

7 Specification

Weight	:	Approx 1400g
Size	:	297mm×184mm×48mm(60mm)
Power	:	AC 90V ~ 250V
Scale Signal	:	TTL, 50KHz (MAX)
RS232	:	9P D-Type
Touch Probe	:	Contact or DC (internal photo couple)